STRENGTHENING DECISION-MAKING PROCESSES TO PROMOTE WATER SUSTAINABILITY IN THE SOUTH AFRICAN MINING CONTEXT:

THE ROLE OF GOOD ENVIRONMENTAL GOVERNANCE AND THE LAW

By

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We shall need a substantially new way of thinking if humanity is to survive.

- Albert Einstein
The Bulletin *Bulletin of the Atomic Scientists Mar 1979: Einstein and Peace* (1979) The Bulletin.

Therefore, apart from the inclusion of socio-economic factors in decision-making powers […] the environmental right of section 24 should be interpreted in the context of inter-generational environmental protection and within the context of sustainable development.

- Germarié Viljoen
G Viljoen *Water as Public Property: A Parallel Evaluation of South African and German Law* PhD Thesis North-West University (2016) 145.

… instead of leading to 'development' and 'sustainability' mining is simply 'extractivism'.

- Tracy-Lynn Field
T-L Field *State Governance of Mining Development and Sustainability* (2019) 1.

DEDICATION

I dedicate this thesis to my daughter Faith T Kengni. She was conceived just when this project was about to take off and born with her kidneys only functioning 7%. She became my source of motivation as she put up a good fight to survive. Her recovery progressed at about the same pace as my thesis. At the time I am submitting this thesis for examination Faith is looking forward to her fifth birthday with a kidney function of 44%.

DECLARATION

I, **Bernard Kengni**:

1. Know that plagiarism is wrong. Plagiarism is to use another's work and pretend that it is one's own.

2. I have used the footnoting convention for citation and referencing. Each contribution to, and quotation in, this thesis from the work(s) of other people has been attributed and has been cited and referenced.

3. This thesis is my own work.

4. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his or her own work.

Signed by candidate

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And most importantly, to God almighty for granting me much needed inspiration and strength.

NOTE ON REFERENCING

The referencing style adopted in this thesis generally complies with the Stellenbosch Law Review Writing, Style and Referencing Guide. The first occasion I refer to a source, I provide its full reference. I thereafter utilise an abridged reference format. Full details on each source are available in the bibliography.

ABSTRACT

This thesis examines whether the concept of good (environmental) governance provides a useful tool and legal base for the achievement of water sustainability in South Africa's mining sector. The thesis introduces water pollution as one sustainability challenge that South Africa is facing in its mining sector. The main question is how the legal framework should promote and guide water sustainability through good environmental governance. The question results from the fact that mining is a constant threat to water resources.

Mining is one of the leading causes of water pollution which adversely affects human life among others when water contaminated with heavy metals is consumed. Farming, as an essential component of food security, is under constant threat in places like Mpumalanga as soils are rendered less productive by mine-contaminated water infiltrating from topsoil or rising from underground mines. Similarly, polluted water adversely affects biodiversity, thus, destroying ecosystems and vegetation which serve as livestock feed.

The analysis of sustainability, governance and good governance theories and specific concepts underpinning them shows that they can inform water protection in the South African mining sector. Sustainability, found to be a broad and interdisciplinary concept, is a necessary guideline for the pursuit of water governance in the mining sector. Despite conflicting perceptions or facts regarding sustainability, it is evident that for water to be preserved, sustainable practices are essential. This requires mining activities to be conducted while always minimising the occurrence of water pollution to ensure water sustainability in the South African mining sector.

The thesis also expounds that water sustainability pursued through governance practices is likely to be effective in alleviating or preventing water concerns. Thus, the concept of governance is presented as a tool with which individuals or organisations can achieve effective water sustainability, through decision-making, planning and law enforcement. Governance as a concept is complex, multifaceted and interdisciplinary, but can ensure water sustainability and the wellbeing of members of society who depend on the natural environment.

The thesis further highlights that water sustainability is more likely when pursued through governance in its best possible form. The concept of good environmental

governance is therefore explained as a theory that can guide effective decision-making and serve as a tool at the disposal of interested and affected parties to judge the performance of administrative officials. Effective decision-making processes and its elements are to be promoted through cooperative governance, accountability, transparency and public participation, for effective administrative action.

The thesis then analyses the South African legal framework and establishes that water governance in the mining sector is extensively catered for therein. The Constitution sets the water sustainability mandate based on which legislation is enacted, both followed by legal interpretation in the courts. The analysis, however, show that there are various shortcomings relating to the implementation and enforcement of the law through administrative action. Nevertheless, the analysis remains hopeful that water sustainability can still be achieved in the mining sector.

Despite the existence of environmental provisions and various attempts to achieve water sustainability, the current South African legal framework still fails to control water pollution effectively. The failure may be attributed to the shortcomings of the said framework, but it is, to a larger extent, a result of poor implementation and enforcement. One main reason is less effective administrative action due to inefficient decision-making processes, which implies that the quality of governance regarding water protection in the mining sector is inadequate. Such findings show that water sustainability could have been achieved or improved if decisionmakers had relied fully on good governance principles to implement and enforce provisions aimed at water protection in the mining sector. Hence, this thesis finds that no new regulation is required; rather it suggests a reform of various provisions within the existing legal framework to improve water sustainability. This is subject to improved implementation and enforcement mechanisms.

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CHAPTER ONE: INTRODUCTION

1 Background

Mining can affect society both positively and negatively.[1] It is said, for instance, that mining can be of great economic significance to South Africa.[2] However, the potential of mining activities to stimulate economic growth does not always materialise, especially in areas where the communities surrounding mines tend to remain mining-dependent.[3] Moreover, the economic gains to be made from the exploitation of mineral resources come at a price: the negative impacts to the environment can be severe. In particular mining activities can cause damage to the top- and sub-soil; and can cause pollution.[4]

Pollution in the mining sector is classified into three categories: soil, air and water pollution.[5] Of these three categories, water is of particular interest to this study. As a natural resource, water is not only scarce, but can be non-renewable.[6] The economic exploitation of some natural resources – such as minerals, oil and gas - can affect another natural resource – water – severely.[7] These impacts are particularly experienced by local communities, that is groups of people who live around mines and who are affected by the mining activities.[8] They may depend on the mines for their

[1] P Hobbs, SHH Oelofse & J Rascher "Management of environmental impacts from coal mining in the Upper Olifants River catchment as a function of age and scale" (2008) 24 *Int. J. Water Res. Environ.* 417 421.
[2] STATSSA "Mining: Production and sales" (10-10-2019) *Statistical Release* P2041 6-11 <http://www.statssa.gov.za/publications/P2041/P2041August2019.pdf> (accessed 02-11-2019); N Wenzel, B Freund & O Graefe "Surviving in the BRICS: the struggle of South African business in coping with new partners and investors" (2019) 33 *International Review of Applied Economics* 51 54.
[3] D van Rooyen & J van Zyl "Businesses in Postmasburg: Tshipe e lokile ('iron is good') – but what about business?" in P Burger, L Marais & D van Rooyen (eds) *Mining and Community in South Africa: From Small Town to Iron Town* (2017) 215 215-216.
[4] RK Tiwary "Environmental Impact of Coal Mining on Water Regime and its Management" (2001) 132 *Water, Air, and Soil Pollution* 185 185-186.
[5] A Eberhard *The Future of South African Coal: Market, Investment, and Policy Challenges* (2011) *Working Paper 100, Program on Energy and Sustainable Development* 4.
[6] WN Meyer *The Economics of Water: Water for Life : Sanitation for Dignity* (2007) 9; MFP Bierkens, S Reinhard, JA de Bruijn, W Veninga & Y Wada "The shadow price of irrigation water in major groundwater-depleting countries" (2019) 55 *Water Resources Research* 4266 4267-4268.
[7] JWN Tempelhoff, M Ginster, S Motloung, CM Gouws & JS Strauss "The 2012 acid mine drainage (AMD) crisis in Carolina's municipal water supply" (2014) 46 *African Historical Review* 77 80-81; S Kings "Carolina's water woes indicate larger structural problems" (19-07-2012) *Analysis* <http://mg.co.za/article/2012-07-19-carolina-water-woes-structural-problems> (accessed 12-08-2019).
[8] Bench Marks Foundation *Communities in the platinum minefields* (2012) Policy GAP 6 1.

livelihoods,[9] but they also depend on the environment around mines for survival.[10] This research is specifically interested in addressing how water pollution resulting from mining activities may be alleviated through decision making, from a legal perspective. This can be done in the interest of communities that are vulnerable, because they are already affected or likely to be affected, directly or indirectly, by the consequences of mining on their access to water.

2 Problem Exposition

In South Africa, the mining industry forms the backbone of the economy.[11] Mining constitutes one of the most significant economic activities in South Africa. Mining accounts for 8% of the country's Gross Domestic Product ("GDP").[12] A 2016[13] report classified South Africa as the fifth most important mining nation in the world.[14] The most important minerals that can be mined in South Africa are gold, platinum group metals (PGM),[15] coal and diamonds. South Africa is reported to hold the world's biggest deposits of gold, PGM, chrome and manganese ore.[16] South Africa's mineral income is mostly found in the upper part of the country,[17] as illustrated in the figure below.

[9] S Haley & D Fisher "Indigenous employment, training and retention: Success and challenges at Red Dog Mine" in E Gilberthorpe & G Hilson (eds) *Natural Resource Extraction and Indigenous Livelihoods: Development Challenges in an Era of Globalization* (2016) 11 12.
[10] E Gilberthorpe & G Hilson "Introduction" in E Gilberthorpe & G Hilson (eds) *Natural Resource Extraction and Indigenous Livelihoods: Development Challenges in an Era of Globalization* (2016) 1 1.
[11] Chamber of Mines of South Africa *Annual Report 2013/2014* (2014) 2; Wenzel et al. "Surviving in the BRICS:" 51 54.
[12] STATSSA "Gross Domestic Product: 2nd Quarter 2019" (3-9-2019) <http://www.statssa.gov.za/publications/P0441/GDP%202019%20Q2%20(Media%20presentation).pdf> (accessed 02-11-2019).
[13] Though the report was published in 2016 the data dates back to 2014.
[14] ICMM *The Role of Mining in National Economies* (2016) 22.
[15] These include: ruthenium, rhodium, palladium, osmium, iridium, and platinum.
[16] GCIS "Mineral Resources: Pocket Guide to South Africa 2012/13" (2013) 150 <http://www.gcis.gov.za/sites/www.gcis.gov.za/files/docs/resourcecentre/pocketguide/2012/15%20Mineral%20Resources.pdf> (accessed 02-06-2015).
[17] GCIS "Mineral Resources:" 151.

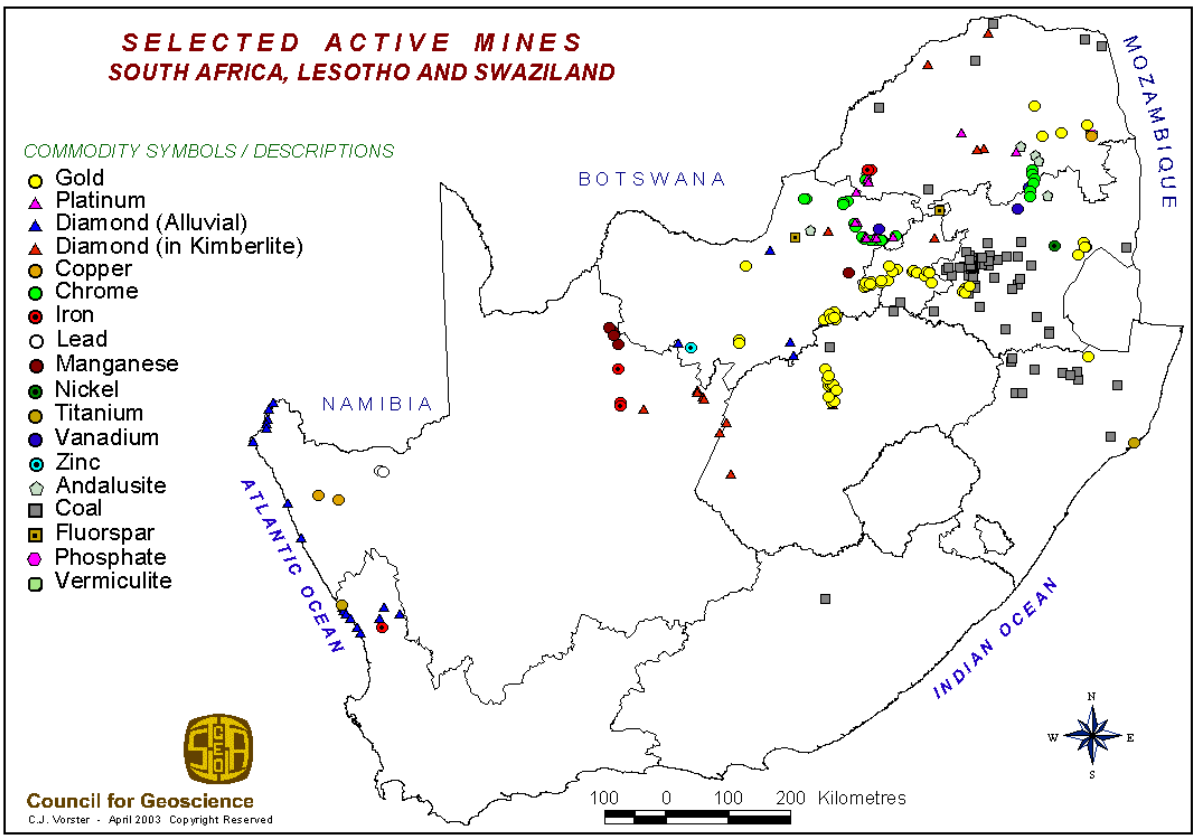

Figure 1: Map illustrating areas with mineral deposits in South Africa[18]

Despite diamonds, gold and the PGMs receiving so much interest, coal also counts among major mined minerals in South Africa.[19] It has until now been crucial for the generation of electricity.[20] 85% of South Africa's total electricity generation is from coal.[21] The employment rates in the mining sector are significant, with about 452 000 people directly employed in the second quarter of 2018.[22]

However, due to climate-change pressures, coal mining is on the decline.[23] In addition to climate change, the likely decommissioning of the once lucrative coal mines will leave blights on the landscape and the environment.[24] This will be an exacerbation of

[18] Council for Geoscience "Selcted active mines" (2003) <http://www.geoscience.org.za/images/Maps/selectedactivemines.gif> (accessed 02-11-2019).
[19] Minerals Council "Mining in South Africa" (2019) <https://www.mineralscouncil.org.za/sa-mining> (accessed 02-11-2019).
[20] Eberhard *The Future of South African Coal* 4.
[21] B Lin & Wesseh Jr PK "Energy consumption and economic growth in South Africa reexamined: A nonparametric testing apporach" (2014) 40 *Renewable and sustainable energy reviews* 840 842.
[22] STATSSA *Quarterly Employment Statistics* (2018) Statistical Release P0277 3.
[23] R Martin *Coal Wars: The Future of Energy and the Fate of the Planet* (2015) 254.
[24] SE Mhlongo & F Amponsah-Dacosta "A review of problems and solutions of abandoned mines in South Africa" (2015) 30 *International Journal of Mining, Reclamation and Environment* 279 281 & 285.

the already existing issues such as water pollution, which will require further remediation efforts, especially at old or discontinued mine sites.[25]

The primary concern of this research is how appropriate law-making and good governance can limit the adverse effects of water pollution caused by mining, especially on vulnerable communities. There are several angles from which to investigate the means to address the impacts of mining on communities in particular areas, and each of these vantage points present its own challenges, be they environmental, legal or governance related. As discussed below,[26] a survey of responses from the environmental context suggests that so far, existing challenges have yet to be addressed adequately. Closely linked to these challenges from the legal perspective are the ones relating to systems of governance. The following sections provide some context to the challenges.

2.1 Context: The Water Sustainability Challenge

The research is borne out of the concern for the adverse effects of mining on the environment.[27] The effects of mining on water in particular are considerable, despite the positive impact that a mining economy might have for South African society at large.[28]

South Africa is arid with rainfall below the global average,[29] and its water resources are unevenly distributed.[30] Available data shows that, as of 2014, renewable freshwater availability was about 843 cubic meters (m^3) *per capita*, while in a non-arid

[25] NO Novhe, B Yibas, H Coetzee, M Atanasova, R Netshitungulwana, M Modiba & T Mashalane "Long-term remediation of acid mine drainage from abandoned coal mine using intergrated (anaerobic and aerobic) passive treatment system in South Africa: A pilot study" (2016) *Mining Meets Water-Conflicts and Solutions* 668 669 & 674.
[26] See subsections 2.1, 2.2 & 2.3 of this section.
[27] MO Fashola, VM Ngole-Jeme & OO Babalola "Heavy metal pollution from gold mines: Environmental effects and bacterial strategies for resistance" (2016) 13 *International Journal of Environmental Research and Public Health* 1047 2 & 4.
[28] J Glazewski *Environmental law in South Africa* 2nd ed (2005) 457; C Musvoto & WJ de Lange "A framework for selecting crops for irrigation using mining contaminated water: An example from the Olifants basin of South Africa" (2019) 231 *Journal of Environmental Management* 49 49-50.
[29] L Feris & LJ Kotze "The regulation of acid mine drainage in South Africa: law and governance perspectives" (2014) 17 *PELJ* 2104 2106.
[30] L Nhamo, B Ndlela, C Nhemachena, T Mabhaudhi, S Mpandeli & G Matchaya "The water-energy-food nexus: Climate risks and opportunities in southern Africa" (2018) 10 *Water* 1 5.

country such as the United States of America it was 8904 m^3.[31] With less than 1000 m^3 per capita, it is clear that South Africa is water scarce.[32]

It is projected that South Africa's issues relating to water scarcity will be further exacerbated by climate change.[33] Though Sustainable Development Goal six seeks to achieve safe and affordable drinking water for all by 2030,[34] it is also predicted that South Africa will face "absolute water scarcity"[35] by 2035,[36] while estimates indicate that the country's water demands will double in the next 30 years.[37] Under such circumstances, South Africa cannot afford to lose valuable water stores to pollution. Nonetheless, mining is one of the polluting activities and one on which the country, and the local mining communities, are highly dependent for income.[38]

Available data indicates that past mining activities have polluted water, present mining activities are polluting water, and future activities will continue to do so.[39] Water pollution occurs at various levels, including underground water,[40] streams and rivers,[41] dams,[42] and water filled in abandoned coal mines resulting from rainfall or water from other mines.[43]

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[31] World Bank "Renewable internal freshwater resources per capita (cubic meters)" (2015) *Data* <http://data.worldbank.org/indicator/ER.H2O.INTR.PC> (accessed 12-08-2019).
[32] M Kohler "Confronting South Africa's water challenge: A decomposition analysis of water intensity" (2016) 19 *SAJEMS* 831 831.
[33] L Fisher-Jeffes, K Carden, NP Armitage, & K Winter "Stormwater harvesting: Improving water security in South Africa's urban areas" (2017) 113 *S. Afr. J. Sci* 1 2.
[34] UN "Goal 6: Ensure access to water and sanitation for all" <https://www.un.org/sustainabledevelopment/water-and-sanitation/> (assessed 18-04-2020).
[35] Absolute water scarcity is when water supplies drop below 500 m^3 per capita. See FAO "Aquastat" <http://www.fao.org/nr/water/aquastat/data/glossary/search.html?termId=7566&submitBtn=s&cls=yes > (accessed 04-11-2019).
[36] WWF "Scenarios for the Future of Water in South Africa" (2017) *Report* 7-8.
[37] A du Plessis *Freshwater Challenges of South Africa and its Upper Vaal River: Current State and Outlook* (2017) 66.
[38] N Ranchod, CM Sheridan, N Pint, K Slatter & KG Harding "Assessing the blue-water footprint of an opencast platinum mine in South Africa" (2015) 41 *Water SA* 287 287-288.
[39] Tiwary (2001) *Water, Air, and Soil Pollution* 186; Glazewski *Environmental law in South Africa* 457; MBJ Harfoot, DP Tittensor, S Knight, AP Arnell, S Blyth, S Brooks, SHM Butchart, J Hutton, MI Jones & V Kapos "Present and future biodiversity risks from fossil fuel exploitation" (2018) 11 *Conservation Letters* 2.
[40] G Blight *Geotechnical Engineering for Mine Waste Storage Facilities* (2010) 369; Ranchod et al. (2015) *Water SA* 288.
[41] K Crowley "Water pollution near mines prompts South African probe" (22-05-2014) *Business* <http://www.bloomberg.com/news/articles/2014-05-21/water-pollution-near-mines-prompts-south-african-ombudsman-probe> (accessed 12-08-2019).
[42] DWA *The Annual National State of Water Resources Report October 2011 to September 2012* (2012) iv.
[43] PD Vermeulen, L-M Deysel, N MacDonald & V Aphane "Spoils handling from coal mines in the Waterberg Coalfield Area, South Africa" (2014) *Institute for Groundwater Studies, University of the Free*

Mine dumps or waste from mining activities are regularly mixed with water, as a result of surface water runoff.[44] In other instances, water fills up abandoned and non-rehabilitated mines.[45] Such fill-ups increase the risk of overflow floods into adjacent abandoned and productive mines,[46] or into nearby rivers and streams, or onto neighbouring land, contaminating underground water when absorbed into the soil.[47]

Coal and gold mining are considered the most polluting of all mining activities in South Africa.[48] The mining of these two minerals releases hazardous substances into the environment, including sulphur and acid.[49] For example, coal slurry[50] is toxic and a potential threat to underground water.[51] These substances contribute to the occurrence of Acid Mine Drainage (AMD),[52] which consists of the outflow of acidic water from mostly coal and gold mines.[53]

This research uses known experiences with contamination of some areas across South Africa where mining occurs.[54] Certain mining areas are close or around water sources. For instance, the Witbank and Middelburg Dams located in mining areas

State 528 <http://www.mwen.info/docs/imwa_2014/IMWA2014_Vermeulen_524.pdf> (accessed 12-08-2019).

[44] PJ Ashton, D Love, H Mahachi & P Dirks *An overview of the impact of mining and Mineral Processing Operations on water resources and water quality in the Zambezi, Limpopo and Olifants Catchments in Southern Africa. Contract Report to the Mining, Minerals and Sustainable Development Project Southern Africa, ENV-P-C 2001-042* (2001) I; P Gomes, T Valente & P Pereira "Addressing quality and usability of surface water bodies in Semi-arid regions with mining influences" (2018) 5 *Environmental Processes* 707 714 & 717.

[45] PJ Lloyd "Coal mining and the environment" (2002) *Energy Research Institute* 1 2-3; D Klopper & JA Wessels "Investigation of Western Australia's rehabilitation fund as a fiscal policy solution for South African abandoned mines" (2017) 117 *J. South. Afr. Inst. Min. Metall.* 1081 1081.

[46] PD Vermeulen & BH Usher "An investigation into recharge in South African underground collieries" (2006) 106 *SAIMM* 771 771 & 772.

[47] FG Bell, SET Bullock, TFJ Hälbich & P Lindsay "Environmental impacts associated with an abandoned mine in the Witbank Coalfield, South Africa" (2001) 45 *International Journal of Coal Geology* 195 205; S Movik *Fluid Rights: Water Allocation Reform in South Africa* (2012) 69.

[48] Movik *Fluid Rights:* 69.

[49] TS McCarthy "The impact of acid mine drainage in South Africa" (2011) 107 *S. Afr. J. Sci* 1 2-3.

[50] A mixture of solid and liquid waste.

[51] JD Quaranta, B Mack, B Van Aken, A Ducatman & P Ziemkiewicz "Practical Application of Dilution Analysis for Estimating Groundwater Quality Effects Due to Coal Slurry Injection into Underground Mine Voids" (2014) 33 *Mine Water and the Environment* 353 354.

[52] PA Raymond & N-H Oh "Long term changes of chemical weathering products in rivers heavily impacted from acid mine drainage: Insights on the impact of coal mining on regional and global carbon and sulfur budgets" (2009) 284 *Earth and Planetary Science Letters* 50 56.

[53] Raymond & Oh (2009) *Earth and Planetary Science Letters* 56.

[54] GB Simpson, J Badenhorst, M Berchner, G Jewitt & E Davies "Competition for Land: The Water-Energy-Food Nexus and Coal Mining in Mpumalanga Province, South Africa" (2019) 7 *Frontiers in Environmental Science* 1 4.

provide sources of potable water for Emalahleni residents.[55] These dams thus provide a useful platform for the analysis of the legal framework in this context. Water pollution caused by mining activities across South Africa presents many challenges, including health risks and soil damage,[56] which in turn affects farming and the ecosystem.[57] Such consequences are likely to continue, as the Olifants River, for example, continues to show signs of pollution caused by mining activities.[58]

One main effect of environmental challenges posed by mining is community vulnerability to mining impacts such as water pollution.[59] As explained below, vulnerability is a threat to mine communities' livelihood.

2.2 Effect: Vulnerability to the Environmental Impacts of Mining

Vulnerability arises where one is in a state of predisposition to be affected negatively by a hazardous event.[60] In the mining context and with regard to environmental degradation, people are generally vulnerable when they are at risk of or susceptible to be impacted adversely by environmental challenges resulting from mining.[61]

Vulnerability to the environmental impacts of mining in South Africa is characterised by the likelihood of communities to be adversely impacted by environmental challenges such as water pollution.[62] In this context, the current environmental challenges, as explained in the preceding section, show that mine communities around South Africa are vulnerable to the adverse effects of mining.[63] This is

[55] DWA *Development of a reconciliation strategy for the Olifants River Water Supply System: Water Quality Report* (2011) 10.
[56] SJ Schonfeld, F Winde, C Albrecht, D Kielkowski, M Liefferink, M Patel, V Sewram, L Stoch, C Whitaker & J Schüz "Health effects in populations living around the uraniferous gold mine tailings in South Africa: gaps and opportunities for research" (2014) 38 *Cancer Epidemiology* 628 628 & 630.
[57] JF Durand "The impact of gold mining on the Witwatersrand on the rivers and karst system of Gauteng and North West Province, South Africa" (2012) 68 *Journal of African Earth Sciences* 24 35.
[58] JM Dabrowski, J Dabrowski, L Hill, P MacMillan & PJ Oberholster "Fate, transport and effects of pollutants originating from acid mine drainage in the Olifants River, South Africa" (2015) 31 *River Research and Applications* 1354 1357.
[59] B Genthe, T Kapwata, W Le Roux, J Chamier & CY Wright "The reach of human health risks associated with metals/metalloids in water and vegetables along a contaminated river catchment: South Africa and Mozambique" (2018) 199 *Chemosphere* 1 8.
[60] C Giupponi, V Mojtahed, AK Gain, C Biscaro & S Balbi "Integrated risk assessment of water-related disasters" in P Paron (ed) *Hydro-Meteorological Hazards, Risks, and Disasters* (2014) 163 182-183.
[61] RK Jain, ZC Cui & Domen JK *Environmental Impact of Mining and Mineral Processing: Management, Monitoring, and Auditing Strategies* (2015) 53; Genthe et al. "The reach of human health risks associated with metals/metalloids in water and vegetables along a contaminated river catchment" 7-8.
[62] Genthe et al. (2018) *Chemosphere* 7.
[63] V Nkosi, J Wichmann & K Voyi "Mine dumps, wheeze, asthma, and rhinoconjunctivitis among adolescents in South Africa: Any association?" (2015) 25 *IJEHR* 583 584.

particularly with regard to their livelihoods which are constantly threatened because of water pollution.[64] The vulnerability of communities in that regard, is threefold.

First, when water sources in areas such as Gauteng and Mpumalanga are contaminated by mining, communities are likely to struggle with access to clean and safe drinking water as well as safe water for industrial and recreational purposes.[65] Second, people's health is at risk, should they drink or consume products manufactured with contaminated water,[66] as explained in Chapter Two below.[67] Third, mine communities are vulnerable to the threat posed by mining to the food chain.[68] Plants and livestock are likely to be contaminated following the absorption and drinking of water containing heavy metals.[69] Such water also has the potential to render arable soil unsuitable for farming,[70] as explained in Chapter Two below.[71] Thus, a threat to the food chain by mining in South Africa renders communities vulnerable to food insecurity.[72] These issues relate to challenges associated with the legal framework.

2.3 Problem: Legislative Framework

Although existing laws are aimed at achieving both profitability and equitable access to natural resources, serious repercussions for communities in mining areas remain.[73] Inefficient implementation and enforcement of the existing legal framework coupled with poor governance,[74] contribute to the problem. This is justified by the existence of multiple abandoned mines and cases of water pollution across South Africa.[75]

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[64] SL Liefferink, ES Van Eeden & V Wepener "Past, present and future use of municipal water and freshwater resources of the Bekkersdal Community, Westonaria, South Africa" (2017) 5 *JSDEWES* 430 441.
[65] 441.
[66] Genthe et al. (2018) *Chemosphere* 2; Liefferink et al. (2017) 5 *JSDEWES* 437.
[67] See section 4 of Chapter Two.
[68] SP Varnavas, AG Panagos & KG Kritsotakis *Environmental impact of mine activities on the Hermioni area, Greece* (1993) 119 145.
[69] BJ Alloway "Sources of heavy metals and metaloids in soils" in BJ Alloway (ed) *Heavy Metals in Soils: Trace Metals and Metalloids in Soils and their Bioavailability* 3rd ed (2012) 11 43-44.
[70] TC Davies & HR Mundalamo "Environmental health impacts of dispersed mineralisation in South Africa" (2010) 58 *Journal of African Earth Sciences* 652 652 & 656.
[71] See section 4 of Chapter Two.
[72] Davies & Mundalamo (2010) *Journal of African Earth Sciences* 661 & 663; H Eijsackers, A Reinecke, S Reinecke & M Maboeta "Threatened southern African soils: A need for appropriate ecotoxicological risk assessment" (2017) 63 *EIA Review* 128 133.
[73] ELAW *Guidebook for Evaluating Mining Project EIAs* (2010) 3-4.
[74] Hobbs et al. (2008) *Int. J. Water Res. Environ.* 417.
[75] These examples are elaborated upon in Chapter Two and Eight.

In South Africa, laws and policies have been passed to ensure better regulation and good governance in the mining sector.[76] Section 24 of the Constitution of the Republic of South Africa, 1996 (the Constitution) provides for environmental protection:[77] all people have the right to an environment that promotes their safety and well-being,[78] and pollution of that environment must be prevented.[79] Local communities around the mines may want to invoke their fundamental right to constitutional protection of their environment.

The fundamental right to environmental protection is realised through the legal and regulatory frameworks of the country.[80] For protection in the context of mining, this protection is afforded through a portfolio of general and more specific provisions. The extraction of mineral resources is, in particular, subject to the Mineral and Petroleum Resources Development Act (MPRDA).[81] The core purpose of the MPRDA is to ensure equitable access to, and sustainable utilisation of, the nation's natural resources.[82] Before its amendment in 2008,[83] the MPRDA also contained provisions aimed at environmental protection. It required applicants of prospecting rights to submit an environmental management plan.[84] The Minister of Minerals Resources[85] could only issue a prospecting right if the prospecting will not cause unacceptable pollution.[86] Following acceptance of the application for a mining right, an applicant had to conduct an environmental impact assessment and submit the requisite environmental reports.[87]

Amendments to the MPRDA have moved the authority for environmental regulation in the context of prospecting, exploration and mining[88] to the National Environmental

[76] CI Stevens "South Africa" in A Falach (ed) *The International Comparative Guide to Mining Law 2015: A Practical Cross-border Insight into Environment and Climate Change Law* 2nd ed (2015) 202 202-203.
[77] S 24 of the Constitution.
[78] S 24(a).
[79] S 24(a)(i).
[80] J Southalan *Mining Law and Policy: International Perspectives* (2012) 110.
[81] Act 28 of 2002.
[82] Ss 2 & 3 of the MPRDA.
[83] T-L Humby "'One Environmental System': aligning the laws on the environmental management of mining in South Africa" (2015) 33 *JERL* 110 117-118.
[84] S 16(4)(a) of the MPRDA.
[85] Currently Minister of Mineral Resources and Energy.
[86] S 17(1)(c) of the MPRDA.
[87] S 22(4)(a).
[88] See introductory paragraph to the National Environmental Management Laws Amendments Act 25 of 2014.

Management Act (NEMA).[89] The NEMA is the primary legislation that addresses environmental protection in South Africa. NEMA makes it clear that environmental management should accord proper consideration to the needs of the people.[90] Even more important is the requirement that sustainable development should consider avoiding environmental pollution or at least minimising it where it cannot be totally avoided.[91] The Act also promotes community wellbeing through environmental awareness.[92] Although the recent amendments have moved environmental regulation within the mining sector from the MPRDA to the NEMA, they, however, grant the authority to implement such rules within the mining sector to the Minister of Mineral Resources.[93] The Minister of Environmental Affairs is charged with the responsibility to make regulations and hear appeals related to environmental issues within the sector.[94]

The National Water Act (NWA)[95] specifically deals with water protection.[96] The Act places a duty on a person who controls, occupies or uses land on which polluting activities occurred or are occurring, to take sensible measures to prevent the occurrence, continuing or recurrence of water pollution.[97] As Schreiner points out, this legislation is unquestionably "one of the most progressive pieces of legislation" governing water in the world.[98] Its preamble, for instance, recognises "the need for the integrated management of all aspects of water resources".[99] The international community hailed the Act as a great step towards translating integrated water resources management into legislation.[100] It has not only been cited, but even inspired countries like China and Zambia to amend their water laws.[101]

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[89] Act 107 of 1998 as amended by the National Environmental Management Laws Amendments Act 25, 2014.
[90] S 2(2) of NEMA.
[91] S 2(4)(a)(ii).
[92] S 2(4)(h).
[93] Humby (2015) *JERL* 125.
[94] Humby (2015) *JERL* 121.
[95] Act 36 of 1998.
[96] Preamble of NWA.
[97] S 19(1).
[98] B Schreiner "Viewpoint—Why has the South African National Water Act been so difficult to implement" (2013) 6 *Water Alternatives* 239 239.
[99] Preamble of NWA.
[100] Schreiner (2013) *Water Alternatives* 244.
[101] Schreiner (2013) *Water Alternatives* 239.

Given the status of the NWA in this context, one would expect water protection in the South African mining sector to be a success. Unfortunately, it is not the case.[102] It is reported that the implementation of the NWA has only been partial.[103] One serious issue is the delay in issuing of water usage licences, which has resulted in application backlogs.[104] The "One Environmental System" (OES) resulting from the amendment of the MPRDA and NEMA aims to synchronise the issuing of mining permits, water use licences and environmental authorisations to ensure the coordination of policies and programmes of different government departments.[105]

However, the OES in practice does not seem to cover water protection and/or management,[106] as the implementation of the NWA is dissociated from the MPRDA and NEMA.[107] This is surprising, considering the serious impacts that mining has on water as mentioned above. Allowing water regulation in the mining sector to be provided under the NWA might not solve the issue of water pollution, as the authority charged with its enforcement is facing issues relating to backlogs.[108] Consequently, as of 2012 some 53 mines were reported to be operating without water-use licences.[109] According to the Department of Water and Sanitation (DWS), 115 mines were operating without water licences in 2019,[110] after it was reported in 2015 that 96 mines were operating without such licences.[111]

An effective regulatory framework is needed to control the nexus between the economic needs of the local community, the larger societal requirements for minerals,

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[102] S Mhlongo, PT Mativenga & A Marnewick "Water quality in a mining and water-stressed region" (2018) 171 *Journal of Cleaner Production* 446 452.
[103] MJ Wilkinson, TK Magagula & RM Hassan "Piloting a method to evaluate the implementation of Integrated Water Resource Management in the Inkomati River Basin" (2015) 41 *Water SA* 633 636-637.
[104] Schreiner (2013) *Water Alternatives* 126; J Howard "Coal mining and the ongoing water crisis: economics, finance & risk" (2016) 9 *Inside Mining* 8 9.
[105] S Mpinga "The One Environmental System for the mining industry: Has it given rise to intra-governmental conflict of interest?" (5-12-2017) *MLIA* <http://www.mlia.uct.ac.za/news/one-environmental-system-mining-industry-has-it-given-rise-intra-governmental-conflict-interest> (accessed 12-07-19); Humby (2015) *JERL* 128.
[106] Humby (2015) *JERL*115.
[107] S 24 of NEMA; S 38(a) of the MPRDA.
[108] Humby (2015) *JERL* 115.
[109] CER *Zero Hour: Poor governance of mining and the violation of environmental rights in Mpumalanga* (2016) 36 <https://cer.org.za/wp-content/uploads/2016/06/Zero-Hour-May-2016.pdf> (accessed 28-10-2019).
[110] N Odendaal "Highveld polluters on the water department's radar" (21-08-2019) *Mining Weekly* <https://www.miningweekly.com/article/highveld-polluters-on-the-water-departments-radar-2019-08-21/rep_id:3650> (accessed 20-04-2020).
[111] CER *Zero Hour:* 35-36.

and the imperative to protect our water resources. With a focus on the current regulatory framework, this research investigates the management and redress of environmental degradation, both as a current and ongoing concern.

2.4 Governance – Decision-Making Standards

The Minister of Minerals Resources and Energy acting on behalf of the state as the custodian of mineral resources is responsible for decision making regarding the implementation and enforcement of the MPRDA.[112] The DWS is charged with decision making regarding the enforcement of the NWA.[113] The Department of Environment, Forestry and Fisheries[114] was previously the decisionmaker in terms of the implementation of the NEMA,[115] but as discussed above, the Department of Minerals Resources and Energy is now responsible for decision making regarding the implementation of the NEMA in the mining context.[116] These three departments would be expected to work according to the concept of co-operative government, which is a constitutional requirement,[117] to avoid the water issues outlined above under 2.1.[118]

Considering the impacts of especially coal mining in South Africa, and in particular its effects on water pollution, there is consensus from environmental lobbyists that too much is left undone and the situation is getting worse.[119] There are reported instances of decision making in the context of administrative action regarding water management being problematic in areas like Inkomati.[120] One cause of problems is the non-consideration of stakeholders' interests.[121] Even with the amendment of the MPRDA and NEMA, concerns remain as to whether the new system will effectively address environmental rights.[122]

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[112] S 3(2) of the MDRDA.
[113] GCIS *South African Year Book 2013/14: Water Affairs* (2014) 432.
[114] Previously Department of Environmental Affairs.
[115] DEA *National Environmental Compliance and Enforcement Report* (2012) 29.
[116] CER "As new environmental laws for mines start coming into effect, confusion reigns" (2014) *News* <http://cer.org.za/news/as-new-environmental-laws-for-mines-start-coming-into-effect-confusion-reigns> (accessed 16-07-2015).
[117] S 41 (h)(i-iv) of the Constitution.
[118] See section 2.1 this chapter.
[119] AP Daso, JO Okonkwo, R Jansen, JDDO Brandao & A Kotzé "Mercury concentrations in eggshells of the southern ground-hornbill (Bucorvus leadbeateri) and wattled crane (Bugeranus carunculatus) in South Africa" (2015) 114 *Ecotoxicology and environmental safety* 61 61-62.
[120] J Brown "Assuming too much? Participatory water resource governance in South Africa" (2011) 177 *The Geographical Journal* 171 180
[121] Brown (2011) *The Geographical Journal* 180.
[122] Humby (2015) *JERL*110.

Focusing specifically on industrial mining, this research assesses the effectiveness of the legal framework for water protection to date. It is posited that the framework has not been effective. Accordingly, the research also sets out to suggest possible solutions for water protection. The focus is largely on those areas where mainly gold and coal are mined, because these minerals have particular relations with the negative impacts of mining on water quality.[123] The research is interested primarily in adapting legal solutions to limit and improve the environmental impacts of mining on vulnerable communities, through good laws and policies, better implementation and good governance.

3 Research Question and Motivation

Considering the existing adverse effects of mining on water, it must be asked how the applicable legal frameworks and governance models deal with the adverse effects of mining activities on water resources in South Africa, and whether these dealings are effective. This research is motivated by the desire to see improved protection of South Africa's scarce water resources. Therefore, the research is interested in establishing key features for a mining regime that would support optimal water protection, especially in as far as such protection benefits communities that are vulnerable to the adverse effects of mining. The aim is threefold: first, to assess how adverse effects can be limited or redressed through laws; second, how the law can be harnessed to improve societal wellbeing as a whole; and third, how implementation of such laws ensures that adverse effects are limited/redressed and wellbeing improved.

These aims and the research question translate into the following three sub-questions:

1. What has led to the present state of water pollution and its effects on communities vulnerable to the adverse effects of mining around South Africa?
2. Are the laws and policies in place constituting a sufficient and well-implemented framework to deal with the problem of water pollution by mining practices?
3. How can the state consider the interests of the vulnerable communities when awarding prospecting and mining rights?

[123] McCarthy (2011) *S. Afr. J. Sci* 5.

4. How should the state enforce compliance of the environmental management plans with mining companies?

The point of focus is how water should be protected as communities, specifically in rural areas rely on it for drinking and farming.[124] The role played by the law and governance of mining in protecting societal needs such as access to clean water is investigated. In pursuing these questions, and in taking account of the reported impacts of mining on people affected or likely to be affected by mining, the research intends to contribute to a broader discourse by suggesting how the law can be improved to counter the negative consequences of mining practices in South Africa.

4 Research Method

The research employs the doctrinal and interdisciplinary research methods through a desktop study of all relevant material. The methods respectively allow the analysis of the legal framework and relevant data drawn from various disciplines including law, mining, water, environmental, sustainability and governance studies. Therefore, the data required for the entire research is drawn from library materials, electronic databases and existing case studies. The gathering of data is informed by the following guidelines:

4.1 Existing Information

Government publications are analysed to point out the importance of mining to the country and how the sector is or should be managed to limit its environmental impacts.[125] Thus, relevant statistics[126] concerning mining are discussed. The regulation and governance of water protection in the mining sector is also discussed.[127]

The research draws from popular media reports to point out that, though mining derives huge sums of money, its current environmental effects are serious.[128] It further

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[124] R Netshitungulwana, B Yibas, C Gauert, D Vermeulen, O Novhe & T Motlakeng "Investigation of the metal contamination in the Upper Olifants Primary Catchment by using stream sediment geochemistry, Witbank coalfield, South Africa" in P Heininger & J Cullmann (eds) *Sediment Matters* (2015) 169 182.
[125] S Mohale, TR Masetlana, M Bonga, M Ikaneng, N Dlambulo, L Malebo & P Mwape *South Africa's Mineral Industry 2013/2014* 31st ed (2015) 15.
[126] Chamber of Mines South Africa "Mining facts and figures" (10-02-2014) <http://www.chamberofmines.org.za/media-room/facts-and-figures> (accessed 19-05-2015).
[127] P Jacobs & W Pulles *Best Practice Guideline H4: Water Treatment* (2007) iv & 30.
[128] L Buthelezi "Director gets jail for land damage" (2014) *Business Report* <http://www.iol.co.za/business/companies/director-gets-jail-for-land-damage-

draws from various sources including industry reports to show that, though the laws, policies and governance structures exist, their impacts must be scrutinised.[129] The research also draws extensively from sources that identify and defend the view that the threat to the environment and shared natural resources is greater in our time.[130]

4.2 Existing Legal Framework

For purposes of legal review, the research will analyse the legislation that addresses the regulation and governance of water protection in the mining sector. Specific reference is made to the MPRDA, NEMA and the NWA to explain their potentials and the gaps and inconsistences therein.[131] It also draws from sources that discuss mineral laws to analyse how such laws regulate environmental protection.[132] Case law is also of great importance to this research, offering insight into how successfully the laws are enforced.[133] Of particular interest to this research is the *Mineral Development, Gauteng Region & another v Save the Vaal Environment (Pty) Ltd* case,[134] one of the first cases to instruct environmental jurisprudence in the new South Africa.[135] It does so by setting a precedence for people's environmental rights to be acknowledged as fundamental rights that must be protected and respected. In addition, the *State v Blue Platinum Ventures and Matome Maponya* case[136] is considered, a landmark judgment

1.1644299#.VXbpQUZHTK8> (accessed on 09/06/2015); M Kidd *Environmental Law* (2008) 86; S Kings, S Wild, R Moatshe & P de Wet "South Africa's greatest thirst has begun" (23-01-2015) *Mail & Guardian* <http://mg.co.za/article/2015-01-22-south-africas-great-thirst-has-begun> (accessed 14-08-2019); T Carnie "Acid threat to St Lucia heritage site" (18-06-2014) *IOL scitech* <http://www.iol.co.za/scitech/science/environment/acid-threat-to-st-lucia-heritage-site-1.1704933#.VXbpR0ZHTK8> (accessed 09-06-2015).

[129] PWC *Highlighting Trends in the South African Mining Industry, 6th ed* (2014)25-26; Glazewski *Environmental law in South Africa* 458.

[130] P Sands, J Peel, AF Aguilar, A Fabra & R MacKenzie *Principles of International Environmental Law* 3rd ed (2012) 897.

[131] T Carnie "Environmental mining impact laws slammed" (10-09-2014) *IOL news* <http://www.iol.co.za/news/crime-courts/environmental-mining-impact-laws-slammed-1.1748957#.VXbeOkZHTK8> (accessed 14-08-2019).

[132] H Mostert *Mineral Law: Principles & Policies in Perspective* (2012); Southalan *Mining Law and Policy:* .

[133] *Mineral Sands Resources (Pty) Ltd v Magistrate for the District of Vredendal, Kroutz NO and Others (18701/16) [2017] ZAWCHC 25*.

[134] *Director: Mineral Development, Gauteng Region & another V Save the Vaal Environment (Pty) Ltd (133/98) [1999] ZASCA 9*.

[135] CER "*Director: Mineral Development, Gauteng Region & another V Save the Vaal Environment (Pty) Ltd [1996] 1 All SA 2004 (T)*" <http://cer.org.za/wp-content/uploads/2011/12/Director-for-Mineral-Development-v-Save-the-Vaal.pdf> (accessed 09-06-2015).

[136] *State v Blue Platinum Ventures and Matome Maponya (2014) RN126/13*.

in this context,[137] because a director of a South African mine was personally held liable for an environmental offence caused by mining.[138]

4.3 Case Study

The research shares the opinion of other commentators that proper environmental governance depends on the state's good decision-making ability and law enforcement.[139] This research intended to conduct a field study in a selected community. The field study was cancelled due to the unwillingness of the selected government department and mining company to participate in a case study. While the mining company opted to provide the research with desktop data, the government department declined its participation, citing its involvement in an ongoing court battle involving mining in the area selected for the case study. To compensate for the lack of field study, the research draws significantly from existing case studies, with specific attention on very active mining areas, including Mpumalanga and Gauteng provinces.[140] The choice for those areas is based on the fact that they are some of the places in South Africa with most polluted water resulting from mining.

5 Thesis Structure

The research is outlined as follows:

Part One: Introduction

Chapter One introduces the reader to the topic, by presenting the motivation, premise and research question and provides some background.

Chapter Two highlights the current impacts of mining on the environment, setting out to show the existing problem. This chapter, therefore, describes how the environment

[137] Buthelezi "Director gets jail for land damage".
[138] S Kings "Mining boss found liable for company's environment damage" (04-02-2014) *Environment* <http://mg.co.za/article/2014-02-04-director-found-liable-for-companys-environment-damage> (accessed 14-08-2019).
[139] KR Hope Sr "Toward good governance and sustainable development: The African peer review mechanism" (2005) 18 *Governance* 283 285; N Weitz, C Strambo, E Kemp-Benedict & M Nilsson "Closing the governance gaps in the water-energy-food nexus: Insights from integrative governance" (2017) 45 *Global Environmental Change* 165 166 & 168.
[140] M Shapi, MA Jordaan, DS Nadasan, TC Davies, E Chirenje, M Dube & MR Lekoa "Analysis of the Distribution of Some Potentially Harmful Elements (PHEs) in the Krugersdorp Game Reserve, Gauteng, South Africa" (2020) 10 *Minerals* 1 6; GB Simpson, J Badenhorst, M Berchner, G Jewitt & E Davies "Competition for Land: The Water-Energy-Food Nexus and Coal Mining in Mpumalanga Province, South Africa" (2019) 7 *Frontiers in Environmental Science* 1 3-4; Field *State Governance of Mining, Development and Sustainability* 166.

is being and is likely to be impacted by mining and what such impacts imply for mine communities.

Part Two: Theoretical Framework

The chapters in this part focus on the main concepts on which analysis and arguments in the thesis are built. Thus:

Chapter Three explains what "sustainability" as a concept entails. In doing so, environmental sustainability in general and its implication for water protection more specifically in the mining sector are discussed.

Chapter Four focuses on unpacking the concept of governance, and how it relates to environmental sustainability. Environmental governance is therefore explained to highlight the importance of governance for environmental sustainability in the mining context and in so doing set the scene for the discussion on good environmental governance which is the main focus of this research.

Following on the previous chapter, Chapter Five focuses on explaining the concept of good governance and the role that it can play towards the achievement of water sustainability. The purpose is to offer a proper understanding of the concept and precisely that of its principles as they are key to promote water sustainability in the mining sector. To explain the concept of good environmental governance in the context of mining, the research first of all identifies and explains the elements of good governance.

Part Three: Legal Context

The discussion under this part is divided into two chapters.

Chapter Six is dedicated to reviewing the legal framework, to establish the scope of mineral laws and policies available and their potential to promote water sustainability through good environmental governance in the mining sector successfully.

Chapter Seven, on the other hand, analyses the shortcomings of the legal framework. The purpose is to highlight how such shortcomings are likely to hinder the effective pursuit of water sustainability in the mining sector.

Part Four: Implementation and Conclusion

The chapters in this part investigate how law and governance are balanced to achieve a common goal, which is the wellbeing of communities.

Chapter Eight specifically addresses the role played by the state through the executive towards achieving people's wellbeing, particularly water protection, for the present and future generations of South Africa. The chapter further analyses the effectiveness of the implementation of laws towards achieving good environmental governance, by drawing from existing case studies. The purpose is to analyse the effects of mining on water to expose poor or lack of good governance practices in the application of laws and policies relating to mining.

Finally, Chapter Nine provides a comprehensive conclusion; thus, a summary of the key findings of the entire research and establishes recommendations for the amelioration of issues identified within the research.

CHAPTER TWO: THE IMPACTS OF MINING ON WATER RESOURCES IN SOUTH AFRICA

1 Introduction

The effects of water pollution resulting from mining activities, which are traversed in this chapter, illustrate that there is a pressing need to promote environmental sustainability. The chapter describes how water resources have been and are likely to be impacted by mining, and what such impacts mean for mine communities and society at large. The point of departure is that mining should be conducted in a manner that is sensitive to the natural environment, because of its potential to cause issues such as water pollution.[141] This chapter provides context to the analysis of the legal and governance issues expounded in Parts Three and Four of this thesis.

This chapter highlights the background to mining practices and their ability to cause water pollution directly and indirectly in the South African mining sector, despite the provisions in place to promote environmental governance, thus, water sustainability. Similarly, the effects of mining on water resources and their implications for members of society are discussed, to highlight the reason why it is crucial to promote water sustainability in the mining sector.

2 Background to Causes of Water Pollution in the South African Mining Sector

Mining is by nature, a constant threat to the environment.[142] The effects of mining on the environment are a consequence of the long history of mining and the various stages at which mining occurs.[143] Such effects include water pollution which can be attributed to different players in the South African mining sector as well as to the different mining processes as discussed below.

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[141] PL Younger & C Wolkersdorfer "Mining impacts on the fresh water environment: technical and managerial guidelines for catchment scale management" (2004) 23 *Mine Water and the Environment* S2 S2; E Fosso-Kankeu, A Manyatshe, A Munyai & F Waanders *AMD Formation and Dispersion of Inorganic Pollutants along the Main Stream in a Mining Area* (2016) *Proceedings of IMWA 2016 in Freiberg* 391-392.

[142] Fosso-Kankeu et al (2016) *Proceedings of IMWA 2016 in Freiberg* 391.

[143] Bell et al. (2001) *International Journal of Coal Geology* 197; L Leonard & T Lebogang "Exploring the impacts of mining on tourism growth and local sustainability: The case of Mapungubwe Heritage Site, Limpopo, South Africa" (2018) 26 *Sustainable Development* 206 206.

2.1 Types of Stakeholders in the Mining Sector

The South African mining sector involves different players, alternatively known as stakeholders. These stakeholders include mining companies, the state and communities,[144] and are varyingly responsible for water pollution in the mining sector. The discussion that follows highlights the extent to which water pollution can be attributed to the three stakeholders.

2.1.1 Responsible Stakeholders: Mining Companies

The private sector often is directly responsible for the physical damage to the environment,[145] and it is difficult to discuss the effects of mining on water resources without implicating mining companies. It is, therefore, necessary to consider mining companies' responsibility regarding water pollution in the sector and its effects on affected communities. Mining companies' activities as described below,[146] continue to affect water sustainability.[147] Water pollution caused by mining companies implies that mining companies lack techniques to control water pollution. It also evidences a lack of compliance with legal and regulatory requirements promoting the protection of water resources, whether intentional or otherwise.[148] Thus, despite provisions to promote good environmental governance in the mining sector, there are still challenges in preventing water pollution in this context.[149]

In some instances, there is not much a mining company can do to end water pollution completely, except by shutting down its operations.[150] Some companies resort to water recycling and treatment as a method to mitigate water pollution, with the purpose of balancing business imperatives and environmental sustainability.[151]

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[144] A Lane, J Guzek & W Van Antwerpen "Tough choices facing the South African mining industry" (2015) 115 *Journal of the Southern African Institute of Mining and Metallurgy* 471 473-474.
[145] A Akcil & S Koldas "Acid Mine Drainage (AMD): causes, treatment and case studies" (2006) 14 *Journal of Cleaner Production* 1139 1139-1140.
[146] See section 2.2 of this chapter.
[147] Akcil & Koldas (2006) *Journal of Cleaner Production* 1142; GB Simpson, J Badenhorst, M Berchner, G Jewitt & E Davies "Competition for Land: The Water-Energy-Food Nexus and Coal Mining in Mpumalanga Province, South Africa" (2019) 7 *Frontiers in Environmental Science* 1 4.
[148] Fosso-Kankeu et al. *AMD Formation and Dispersion of Inorganic Pollutants* 392.
[149] Provisions promoting good governance are analysed in Chapter Six of this thesis.
[150] Operations shutdown is not likely because operation cost has to be recovered. See K Kokko, A Buanes, T Koivurova, V Masloboev & M Pettersson "Sustainable mining, local communities and environmental regulation" (2015) 2 *BarenTS STudieS: Peoples, Economies and Politics* 50 59-60.
[151] SM Liphadzi & AP Vermaak "Assessment of employees' perceptions of approaches to sustainable water management by coal and iron ore mining companies" (2017) 153 *Journal of Cleaner Production* 608 608-609.

Certain companies, such as Kropz in Elandsfontein, design mechanisms from the outset to mitigate water pollution during its operations.[152] It is still too early to determine the effectiveness of Kropz's water protection mechanism as it has only been operating in Elandsfontein for a few years.[153]

On the other hand, there are mining companies that do not actively engage with designing methods to deal with water pollution. This category of companies focuses more on the economic aspect of mining operations.[154] They, therefore, neglect environmental protection which is a prerequisite to mine in South Africa as provided in the legislation,[155] discussed in Chapter Six of this thesis. This assures that some mine owners have failed or avoided to assume the responsibility for the detrimental consequences of their operations on the environment.[156] Such consequences include AMD or contamination of water resources by mercury, sulphate and heavy metals resulting from mining operations.[157]

An instance that highlights companies' attempt to avoid liability is illustrated in *Harmony Gold Mining Company Ltd v Regional Director: Free State Department of Water Affairs and Others*.[158] In this case, Harmony Gold Mining Company Ltd (Harmony Gold) sought to appeal an earlier judgment of the High Court. In *Harmony Gold Mining Company Ltd v Regional Director: Free State Department of Water Affairs and Others,*[159] the North Gauteng High Court had dismissed Harmony Gold's application to the High Court to review a 2009 directive of the Department of Water Affairs[160] and set it aside. The directive required Harmony Gold to comply with earlier

[152] As described in confidential documents relating to Water Use Licence for Kropz's Elandsfontein mine (accessed with Kropz's permission in its Cape Town offices where the said documents are kept).
[153] Kropz's only acquired the Elandsfontein property in 2010. See Kropz "Elandsfontein" (2018) *Projects* <http://www.kropz.com/projects/elandsfontein> (accessed 26-08-2019).
[154] J Henning & M Hauman "Corporate criminal responsibility: A South African perspective" in B Rider (ed) *Research Handbook on International Financial Crime* (2015) 191 203-304.
[155] E Swart "The South African legislative framework for mine closure" (2003) 103 *SAIMM* 489 489-490.
[156] T-L Humby "The spectre of perpetuity liability for treating acid water on South Africa's goldfields: Decision in Harmony II" (2013) 31 *JERL* 453 465-466.
[157] JG Lusilao-Makiese, EM Cukrowska, E Tessier, D Amouroux & I Weiersbye "The impact of post gold mining on mercury pollution in the West Rand region, Gauteng, South Africa" (2013) 134 *Journal of Geochemical Exploration* 111 113.
[158] *Harmony Gold Mining Company Ltd v Regional Director: Free State Department of Water Affairs and Others* (971/12) [2013] ZASCA 206.
[159] *Harmony Gold Mining Company Ltd v Regional Director: Free State Department of Water Affairs and Others* (68161/2008) [2012] ZAGPPHC 127.
[160] Currently Department of Water and Sanitation (since 2009).

directives requiring it and other mining companies to pump out and treat underground water contaminated with AMD, to avoid further water pollution.[161]

Harmony Gold argued that it had ceased mining operations in that area and sold its mine,[162] and the directive could no longer apply to it.[163] The Supreme Court of Appeal dismissed the application on the grounds that the Minister of Water Affairs has the powers[164] to direct any person who has caused water pollution to take necessary measures to manage such pollution.[165] Such measures must be taken even if that person no longer owns or uses the land on which the pollution occurred.[166] This case is a highlight of companies' attempts to avoid compliance with the law or an indication that some mining companies lack the will to deal with water pollution effectively during operations and when activities have been closed down.

The discussion on the role of mining companies in water pollution raises questions regarding companies' practices and the extent to which such companies are willing to mitigate water pollution. In other instances, the failure by some mining companies to assume the responsibility to prevent or mitigate water pollution in the mining sector may be attributed to the state to an extent, as discussed hereunder.

2.1.2 Responsible Stakeholders: The State

An important part of the problem associated with water pollution is poor decision-making processes arising from poor implementation and enforcement of existing laws by the state.[167] The state through the government has the mandate to make decisions regarding the management of South Africa's natural resources, as discussed in Chapter Six below. This includes the implementation and enforcement of existing laws to ensure the protection of water resources in the mining sector.[168]

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[161] [2013] ZASCA 206, para 9.
[162] [2013] ZASCA 206, para 11.
[163] [2013] ZASCA 206, para 1.
[164] S 19(3) of the NWA
[165] [2013] ZASCA 206, para 26.
[166] [2013] ZASCA 206, para 26.
[167] RA Adler, M Claassen, L Godfrey & AR Turton "Water, mining, and waste: An historical and economic perspective on conflict management in South Africa" (2007) 2 *The Economics of Peace and Security Journal* 33 37; V Munnik, G Hochmann, M Hlabane & S Law "The social and environmental consequences of coal mining in South Africa: A case study" (2010) *Environmental Monitoring Group* 1 8-9.
[168] S Naidoo *Acid Mine Drainage in South Africa: Development Actors, Policy Impacts, and Broader Implications* (2016) 79.

The current state of water pollution in the South African mining sector and circumstances under which certain instances of pollution occur suggests poor implementation and enforcement of existing laws.[169] Such poor implementation and enforcement necessarily means that the state is also responsible for water pollution in the mining sector.[170] Chapter Eight of this thesis analyses the effectiveness or lack thereof of good environmental governance in practice. Another stakeholder, although not responsible for water pollution in the mining sector, is communities.

2.1.3 Affected Stakeholders: Communities

Communities, especially those close to mine sites, are key stakeholders in the mining sector.[171] They are also the most likely to be affected by water pollution caused by mining operations.[172] Consequently, communities should play a role in the control or mitigation of water pollution in the South African mining sector.[173] This role can involve monitoring and signalling possibilities of water pollution occurring or its actual occurrence to mining companies and government.[174] The signalling helps mining companies and the government to take measures to manage water pollution and enforce water protection respectively.[175] However, communities neither have the capacity nor the authority to assume such roles.[176]

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[169] JN Edokpayi, JO Odiyo & OS Durowoju "Impact of wastewater on surface water quality in developing countries: a case study of South Africa" in Hlanganani Tutu (ed) *Water Quality* (2017) 401 410.
[170] SHH Oelofse, PJ Hobbs, J Rascher & JE Cobbing *The pollution and destruction threat of gold mining waste on the Witwatersrand: A West Rand case study* (2007) unpublished paper presented at the 10th International Symposium on Environmental Issues and Waste Management in Energy and Mineral Production (SWEMP, 2007), Bangkok 619-621.
[171] R Hamann "Corporate social responsibility, partnerships, and institutional change: The case of mining companies in South Africa" (2004) 28 *Natural Resources Forum* 278 279; R Jain *Environmental Impact of Mining and Mineral Processing: Management, Monitoring, and Auditing Strategies* (2015) 40.
[172] P Kapelus "Mining, corporate social responsibility and the "community": The case of Rio Tinto, Richards Bay Minerals and the Mbonambi" (2002) 39 *Journal of Business Ethics* 275 280.
[173] A Kumah "Sustainability and gold mining in the developing world" (2006) 14 *Journal of Cleaner Production* 315 321; L Matenga & T Gumbo "An assessment of the social impact of acid mine drainage on the West Rand, South Africa: Towards responsive mining and sustainable cities on the African continent" in M Mujuru & SS Mutanga (eds) *Management and Mitigation of Acid Mine Drainage in South Africa: Input for Mineral Beneficiation in Africa* (2016) 66 73.
[174] UN Environment *Global Environment Outlook - GEO-6: Healthy Planet, Healthy People* (2019) 560.
[175] L Nare, D Love & Z Hoko "Involvement of stakeholders in the water quality monitoring and surveillance system: The case of Mzingwane Catchment, Zimbabwe" (2006) 31 *Physics and Chemistry of the Earth, Parts A/B/C* 707 709.
[176] Matenga & Gumbo "An assessment of the social impact of acid mine drainage on the West Rand, South Africa: Towards responsive mining and sustainable cities on the African continent" in *Management and Mitigation of Acid Mine Drainage in South Africa: Input for Mineral Beneficiation in Africa* 74.

Though communities often do raise alarms regarding water pollution in the mining sector, this does not always lead to immediate action to prevent or mitigate water pollution.[177] The reason is that communities are either not taken seriously or government fails to implement legislation, or react appropriately in the context of environmental protection.[178] Government also often acts late on communities complaints[179] regarding water pollution resulting from mining operations.[180] Failure by some mine companies to protect water resources, for instance, is exacerbated among others by their inability to engage with mine-affected communities meaningfully, to find solutions to water pollution.[181] In terms of the above, communities are therefore mostly victims of water pollution, rather than being part of the problem.

Despite acts of commission and omission by mining companies and government specifically, the nature of water pollution is also problematic.[182] The extent of water pollution is often not noticed immediately after its occurrence.[183] This renders the control of water pollution at specific mine sites difficult.[184] Because of a time delay in discovering the extent of water pollution, it also becomes difficult to pinpoint which mine caused the pollution.[185] Consequently, these difficulties distance those responsible from the actual activity causing the problem.[186] This may be one reason why government acts late or never acts.

The above discussion indicates that a mining process is complex, and as explained below, there is much more to mining than just the actual ore leaving the mining sites

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[177] BN Shongwe *The Impact of Coal Mining on the Environment and Community Quality of life: a Case Study Investigation of the Impacts and Conflicts Associated with Coal Mining in the Mpumalanga Province, South Africa* MPhil Thesis, University of Cape Town (2018) 87.
[178] Shongwe *The Impact of Coal Mining on the Environment and Community Quality of life:* 87; CER, CALS, GroundWork, SDCEA, VEJA, HEJN & Earthjustice *Joint Stakeholders' Submission on: The threats to human rights from mining and coal-fired power production in South Africa* (2017) 3.
[179] This has resulted in situation where communities are not made aware of a possibility of water pollution occurring or depend on activism to address water pollution before it occurs. See the discussions in sections 3.1 of Chapter six and 3.1 of Chapter eight.
[180] CER et al. *Joint Stakeholders' Submission* 3.
[181] LA Farrell, R Hamann & E Mackres "A clash of cultures (and lawyers): Anglo Platinum and mine-affected communities in Limpopo Province, South Africa" (2012) 37 *Resources Policy* 194 198.
[182] TS McCarthy & MS Humphries "Contamination of the water supply to the town of Carolina, Mpumalanga, January 2012" (2013) 109 *S. Afr. J. Sci* 1 1 & 3.
[183] McCarthy & Humphries (2013) *S. Afr. J. Sci* 3.
[184] McCarthy & Humphries (2013) *S. Afr. J. Sci* 1.
[185] L Feris "The public trust doctrine and liability for historic water pollution in South Africa" (2012) 8 *Law Env't & Dev. J.* 1 4.
[186] 4.

or the finished products in the hands of consumers. One such complexity is the phases of mining projects and their varying impacts on water resources, as discussed below.

2.2 Water Pollution in the Various Phases of Mining

Mining practices, including the search for and extraction of minerals, takes place at various stages and involves multiple activities.[187] A mining life cycle which is discussed below, spans across three different stages, each of which employs different methods that impact water resources differently.

2.2.1 The Prospecting Phase of Mining

Upon issuance of a prospecting right by the DMRE, prospecting for minerals can begin in accordance with the conditions of the right provided in the MPRDA.[188] Prospecting constitutes the initial stage of mining at which mining companies and the government determine whether mining activities should be carried out in a particular area.[189] Prospecting is a difficult stage in the lifecycle of a mine because it is not easy for prospectors to identify specific economically viable and sustainable minerals deposits in particular areas.[190] Reasons for such challenges during prospecting can vary, as discussed below.

Prospecting in mining refers to the process of locating economically viable concentrations of natural resources to mine.[191] The purpose of prospecting for minerals is, therefore, to discover and delineate a mineral deposit that can be economically developed into a mine.[192] The process is intentional and involves environmental disturbance of top and subsoil, as well as under the sea and watercourse subsurface.[193] Prospecting can also be conducted on residue stockpiles or deposits and in the sea and watercourses on land.[194] The prospecting process varies from one site to another and depends on the type of mineral being sought.[195]

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[187] On both state-owned or private land.
[188] S 5(3) MPRDA.
[189] GJS Govett *Rock Geochemistry in Mineral Exploration Vol 3* (1983) 7; J Teague, MJ Allen & TB Scott "The potential of low-cost ROV for use in deep-sea mineral, ore prospecting and monitoring" (2018) 147 *Ocean Engineering* 333 334-335.
[190] McCarthy (2011) *S. Afr. J. Sci* 02; M Smith (ed) *Mining Methods in Underground Mining* (2007) 13.
[191] S 1 of the MPRDA.
[192] RW Roeder *Foreign Mining Investment Law: The Cases of Australia, South Africa and Colombia* (2016) 65.
[193] S 1 of the MPRDA.
[194] S 1.
[195] Govett *Rock Geochemistry in Mineral Exploration* 7.

Prospecting on the land surface, for instance, requires specific techniques as discussed below. Such techniques are different from those employed when prospecting in water.

At the prospecting phase of mining, information such as the presence of deposits and chemical details relating thereto, as well as environmental and socio-economic data are collected to be used in the planning and designing of the mine.[196] This planning involves the assessment of the potential value of mineral deposits, and whether they can be economically and sustainably mined.[197] Similarly, it must be determined whether the environmental impacts of the mining project can be limited during the development while enabling social and economic benefits to stakeholders.[198] The limiting of environmental impacts includes the prevention or management of water pollution.[199]

The need to determine whether the environmental impacts of mining could be mitigated results from the fact that prospecting activities are likely to disturb the natural environment, as highlighted above.[200] Such environmental disturbance often causes water pollution, especially when digging or drilling takes place.[201] To determine whether a mineral deposit is worth prospecting or mining, and still maintain environmental sustainability requires the following steps.

An area must be identified to find a specific natural resource in a manner that is affordable regarding capital,[202] but environmentally sustainable.[203] One method of prospecting for minerals is geophysical, a geological concept describing the process

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[196] Republic of South Africa "Minerals and Mining Policy of South Africa: Green Paper" (2019) *South African Government* <https://www.gov.za/documents/minerals-and-mining-policy-south-africa-green-paper#top> (accessed 14-01-2019).
[197] M Böhmer & M Kucera *Prospecting and Exploration of Mineral Deposits* 2nd ed (2013) 17.
[198] That is the mining company, local communities, and the government.
[199] LW Canter & RC Knox *Ground Water Pollution Control* (1985) 4-5 & 8; SA Northey, GM Mudd, E Saarivuori, H Wessman-Jääskeläinen & N Haque "Water footprinting and mining: Where are the limitations and opportunities" (2016) 135 *Journal of Cleaner Production* 1098 1102.
[200] Böhmer & Kucera *Prospecting and Exploration of Mineral Deposits* 398.
[201] Ashton et al. *An overview of the impact of mining and Mineral Processing Operations on water resources and water quality* xlviii & ccl.
[202] HL Hartman & JM Mutmansky *Introductory Mining Engineering* 2nd ed (2002) 96.
[203] WL Griffin & CG Ryan "Trace elements in indicator minerals: area selection and target evaluation in diamond exploration" (1995) 53 *Journal of Geochemical Exploration* 311 312; E Schoenberger "Environmentally sustainable mining: The case of tailings storage facilities" (2016) 49 *Resources Policy* 119 126.

by which viable mineral deposits are detected within a particular area.[204] Remote sensing is another method used, which is a modern way of directly detecting minerals and how they vary in terms of composition.[205] Aerial photography is used to detect the quantity of minerals in a given area.[206] The geochemical method can also be used, which entails a chemical analysis of rocks and plants that can indicate the presence and location of underground deposits.[207] Through the geochemical method, it can be determined whether minerals exist in certain areas specifically.[208] Finally, there is the core drilling method often used to extract samples to be tested by geologists for the existence of economically feasible mineral concentrations.[209] Unlike the first two methods, the core drilling method is the method that is capable of causing significant environmental degradation. The implication of this method for water resources is that underground water is likely to be polluted if holes drilled during prospecting are not properly covered or rehabilitated.[210] If the holes are left open, impurities including toxic waste transported by runoff water can go in.[211]

Before acquiring the necessary environmental authorisation and moving from the prospecting phase to the operation phase of a mine, it must be ascertained whether the mineral deposits are valuable enough to cover all costs involved.[212] For instance, it must be ascertained whether the costs of the mine operation, mine closure and rehabilitation will be recovered.[213] The cost for mine rehabilitation is an important

[204] A Tabbagh "The response of a three-dimensional magnetic and conductive body in shallow depth Electromagnetic Prospecting" (1985) 81 *Geophysical Journal International* 215 215-216; Luo, X, S Gong, Z Huo, H Li and X Ding "Application of Comprehensive Geophysical Prospecting Method in the Exploration of Coal Mined-Out Areas" (2019) *Advances in Civil Engineering* 1 2.
[205] Böhmer & Kucera *Prospecting and Exploration of Mineral Deposits* 133.
[206] 133.
[207] RG Garrett, C Reimann, DB Smith & X Xie "From geochemical prospecting to international geochemical mapping: a historical overview" (2008) 8 *Geochemistry Exploration Environment Analysis* 205 208.
[208] Govett *Rock Geochemistry in Mineral Exploration Vol 3* 7-9.
[209] 14.
[210] MW Lema "Analysis of challenges related to poor environmental regulatory framework on mineral exploration projects: a case of Tanzania" (2016) 4 *Journal of Geoscience and Environment Protection* 89 90-92.
[211] R Fernandez-Rubio & DF Lorca "Mine water drainage" (1993) 12 *Mine Water and the Environment* 107 121.
[212] S 23(1)(a) of the MPRDA; BC McLellan, GD Corder, D Giurco & S Green "Incorporating sustainable development in the design of mineral processing operations–Review and analysis of current approaches" (2009) 17 *Journal of Cleaner Production* 1414 1421.
[213] S 23(1)(b) & (c) of the MPRDA.

consideration as proper rehabilitation is costly and necessary to prevent further water pollution beyond mine closure.[214]

In addition to establishing the probability of recovering costs, which guarantees the prospect of available funds for rehabilitation, two main issues must be considered. Consultation with interested and affected parties is critical to include their inputs into project plans, as well as making sure that their needs and concerns are properly addressed.[215] Possible impacts on water are also evaluated at this phase, and it generally takes a few years to conclude the environmental baseline and feasibility studies, as well as the requisite environmental assessment and permitting procedures.[216] These environmental-related processes seek to ensure that necessary measures are taken to mitigate the possible environmental impacts of any given mining project.

Throughout the prospecting phase of mining, companies strive to raise funds to finance and facilitate activities at this stage because such activities are costly and high-risk.[217] These funds are provided by investors, including private individuals, venture capitalists and mining companies.[218] Concerns relating to water and mine rehabilitation form part of the reasons why such funds are required.[219]

Companies move to the next phase once the primary concerns of a mining project, such as its viability and environmental sustainability, are established, and necessary mining rights or permits and environmental authorisations are obtained. The next phase of mining, as discussed below is the development of a mine and the extraction of minerals.

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[214] D Van Heerden "The use of cementation linings to protect ore passes in the mining industry" in E Villaescusa & Y Potvin (eds) *Ground Support in Mining and Underground Construction: Proceedings of the Fifth International Symposium on Ground Support, Perth, Australia, 28-30 September 2004* (2004) 1084 1085; Van Druten, ES and MC Bekker "Towards an inclusive model to address unsuccessful mine closures in South Africa" (2017) 117 *J. S. Afr. Inst. Min. Metall* 485 485-486.
[215] S 10 of the MPRDA.
[216] J Mothomogolo "Development of innovative funding mechanisms for mining start-ups: A South African case" (2012) *SAIMM* 953 956.
[217] Govett *Rock Geochemistry in Mineral Exploration Vol 3* 7.
[218] Mothomogolo (2012) *SAIMM* 954 & 956.
[219] D Lamb, PD Erskine & A Fletcher "Widening gap between expectations and practice in A ustralian minesite rehabilitation" (2015) 16 *Ecological Management & Restoration* 186 186-187.

2.2.3 The Operation Phase

Once the prospecting stage uncovers viable quantities of minerals, a mining company can apply for a mining right to extract those minerals. Once the said right is granted, the stage is set for the development and operation of the mine to begin.[220] Operation is the stage at which huge capital, both human and financial, is invested and in turn, a financial profit is expected in years to come. From an investor's perspective, this stage is perceived as the most profitable stage.[221] That is, once the mine becomes operational, following the installation of the mining infrastructure and equipment.[222] It is also the stage at which issues such as water pollution will occur.[223] This stage involves the construction and extraction substages.

First, before the start of mineral extraction, the mine, associated facilities and necessary infrastructure must be constructed.[224] The development of a mine takes several years to be completed.[225] The duration of such development largely depends on the area in which the mine is located, the size and the complexity of the development, including materials and equipment type needed for development, as well as their availability.[226]

Environmental challenges at this stage are mostly related to deforestation and soil disturbance, which, scientifically, means destabilising soil or rock structure by digging, drilling and moving rocks.[227] Soil disturbance can lead to water pollution, which is, however, not as disastrous as in the extraction phase of mining,[228] as discussed below. Other effects likely to occur in relation to water resources are the diversion of

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[220] S 5(3) of the MPRDA.
[221] D Espinoza, M Goycoolea, E Moreno & A Newman "MineLib: a library of open pit mining problems" (2013) 206 *Annals of Operations Research* 93 105.
[222] IC Runge *Mining Economics and Strategy* (1998) 15; JR Owen & D Kemp "The weakness of resettlement safeguards in mining" (2016) *Forced Migration Review,* issue 52 79.
[223] H Coetzee, F Winde & PW Wade *An Assessment of Sources, Pathways, Mechanisms and Risks of Current and Potential Future Pollution of Water and Sediments in Gold-mining Areas of the Wonderfonteinspruit Catchment: Report to the Water Research Commission* (2006) 36.
[224] Durand (2012) *Journal of African Earth Sciences* 25.
[225] JN Weir, SP Mahoney, B McLaren & SH Ferguson "Effects of mine development on woodland caribou Rangifer tarandus distribution" (2007) 13 *Wildlife Biology* 66 69.
[226] P Kaiser "Rock mechanics challenges in underground construction and mining" (2009) 31 *Newsletter of the Australian Centre for Geomechanics* 1-2.
[227] T Waltham, FG Bell & MG Culshaw *Sinkholes and Subsidence: Karst and Cavernous Rocks in Engineering and Construction* (2005) 162 & 163.
[228] 169.

a watercourse if a mine is constructed on a water path or course.[229] The impact of such diversion may include loss of biodiversity and irrigation issues if farms downstream do not receive any running water.[230]

Upon completion of the construction phase, mineral extraction can begin. The extraction phase becomes effective once a mine shows signs of productivity.[231] Productivity involves extracting the ore, separating minerals and discarding waste, followed by the shipping of economically viable ore minerals to the market.[232] While a mine is operational, further prospecting may be carried out. If more deposits are discovered, this will expand the operation during the life of the mine.[233] In fully operational mines, different minerals may be extracted through different methods, and at different levels, which are either surface, shallow or deep underground mining.[234] Minerals are extracted through different methods for various reasons, as outlined below. The constant, however is the adverse effects that the various methods of extraction have on water resources.

First, the opencast mining method, also known as strip or open pit mining, occurs on the surface.[235] In terms of this method, the topsoil is removed and put aside.[236] The rocks covering the resources are blasted, following which the mineral is extracted,[237] as illustrated in the figure below.

[229] R Stein "Water Law in a Democratic South Africa: A County Case Study Examining the Introduction of a Public Rights System" (2004) 83 *Tex L. Rev.* 2167 2178; A Flatley, ID Rutherfurd and R Hardie "River Channel Relocation: Problems and Prospects" (2018) 10 *Water* 1-2.
[230] S Moyo, M Sill & P O'Keefe *The Southern African Environment: Profiles of the SADC Countries* (1993) 136; Flatley et al (2018) 10 *Water* 14.
[231] V Topp, L Soames, D Parham & H Bloch "Productivity in the mining industry: measurement and interpretation" (2008) *Productivity Commission Staff Working Paper* 14.
[232] A Lala, M Moyo, S Rehbach & R Sellschop "Productivity in mining operations: Reversing the downward trend" (2016) *Metals & Mining Practice* 1 2&10.
[233] USA International Business Publications *South Africa Mining Industry Business Opportunities Handbook* (2007) 93.
[234] Glazewski *Environmental law in South Africa* 455.
[235] E Rusiński, J Czmochowski, P Moczko & D Pietrusiak *Surface Mining Machines: Problems of Maintenance and Modernization* (2017) 1.
[236] R Rajaram "Issues in sustainable mining practices" in V Rajaram, S Dutta and K Parameswaran *Sustainable Mining Practices: A Global Perspective* (2005) 45 70.
[237] McCarthy (2011) *S. Afr. J. Sci* 3.

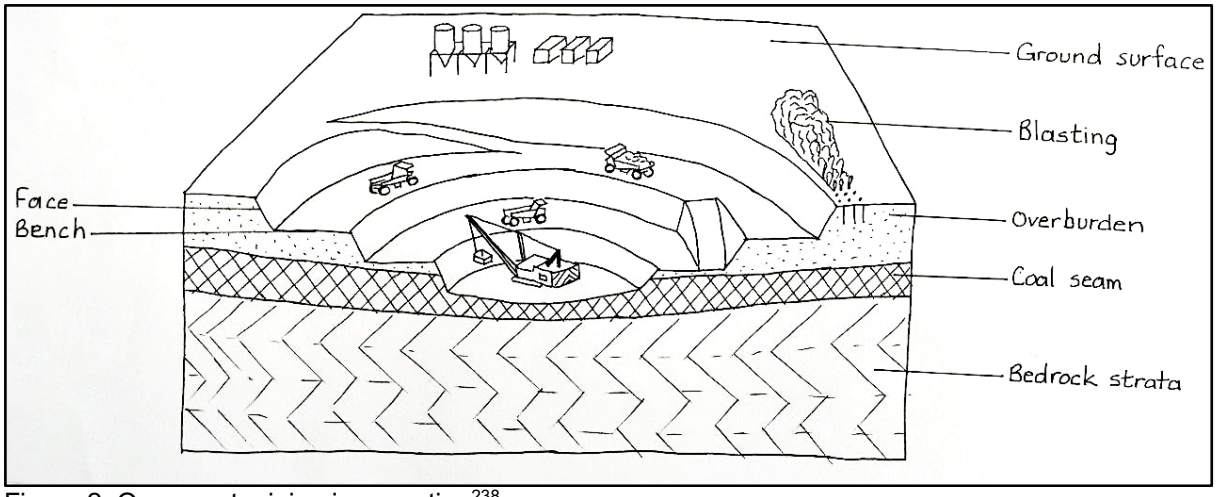

Figure 2: Open cast mining in operation[238]

Once such extraction is completed, the blasted rocks are returned to the empty pit and re-covered with the scrapped soil and then with vegetation.[239]

Opencast mining, especially abandoned, increases the risk of chemical contamination of groundwater because of the seepage of contaminants into the water table.[240] The seepage is facilitated by fissures caused by blasting or soil disturbance.[241] These effects of mining are illustrated in the figure below.

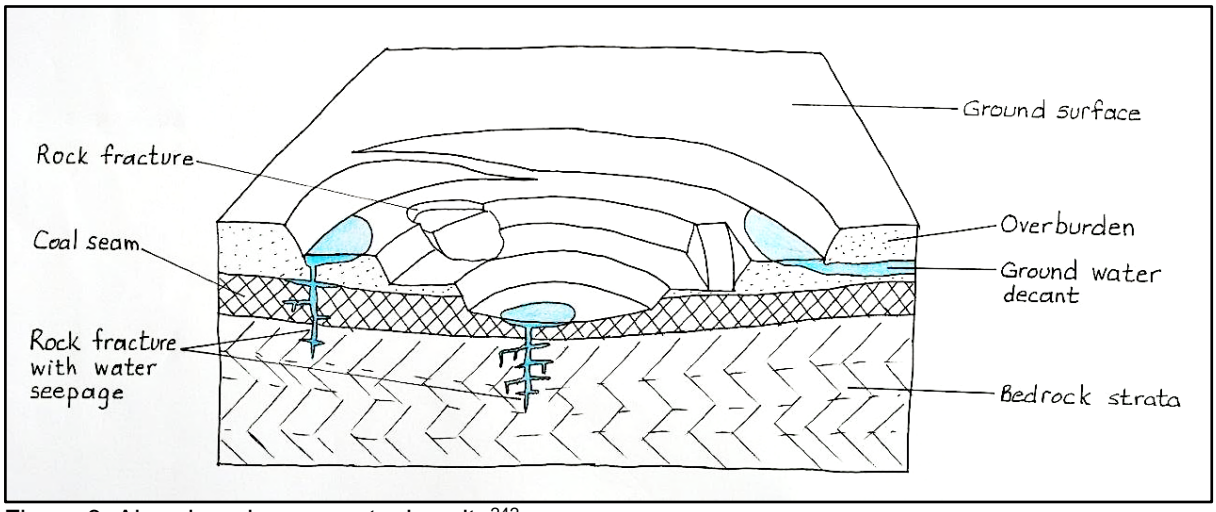

Figure 3: Abandoned open cast mine site[242]

[238] Figure drawn by Gary van der Heyde.
[239] TS McCarthy & K Pretorius *Coal mining on the Highveld and its Implications for Future Water Quality in the Vaal River system* (2009) unpublished paper presented at the International Mine Water Conference 57.
[240] B Prasad & K Sangita "Heavy metal pollution index of ground water of an abandoned open cast mine filled with fly ash: a case study" (2008) 27 *Mine water and the Environment* 265 265-266.
[241] F Cronje & D Van Vyk "Corporations, communities and impact: The case of coal" in W Akpan & P Moyo (eds) *Revisiting Environmental and Natural Resource Questions in Sub-Saharan Africa* (2017) 25 33.
[242] Figure drawn by Gary van der Heyde.

The processing of raw ore, dewatering processes at mines and waste generated during the opencast process also lead to the pollution of surface water.[243] The pollution of water bodies in this instance is more likely to occur when rain washes loosened topsoil and waste into streams, thus, allowing sediments to pollute waterways.[244]

Second, there are the bord and pillar,[245] and the longwall mining methods. The commonality between these two methods is that they occur underground and environmental issues associated with one method are similar to those associated with the other method as described below.[246]

Under the bord and pillar method, only part of the mineral is extracted, while the rest stays in place to serve as pillars supporting the rocks above.[247] The overlying rocks can remain suspended if the supporting pillars are sufficient and or strong enough as illustrated in the figure below.

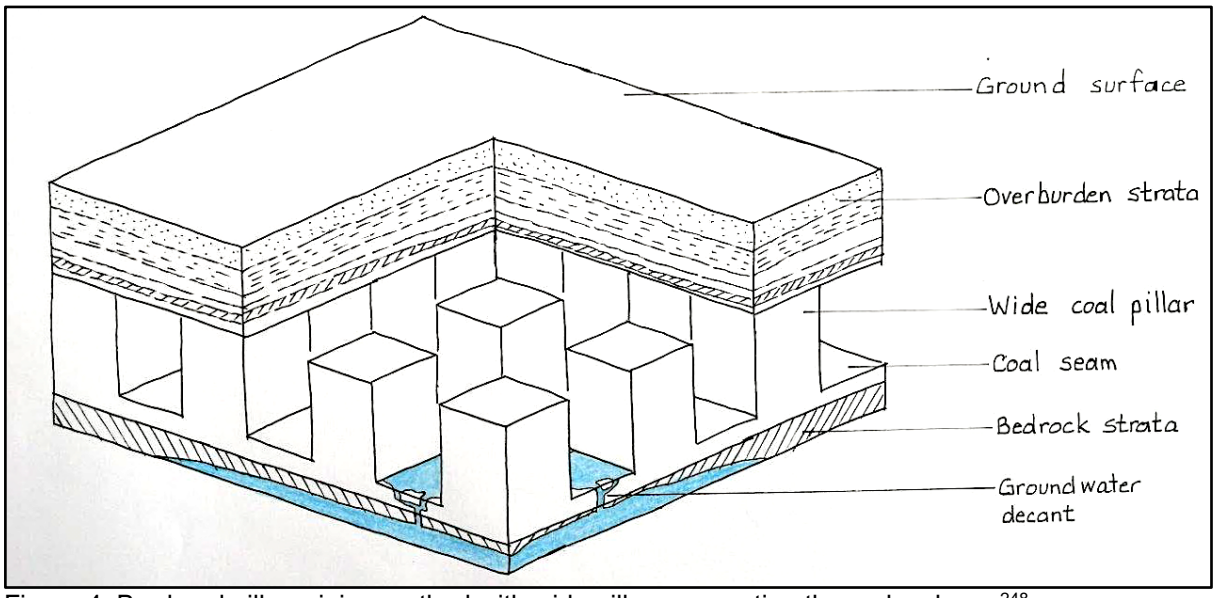

Figure 4: Bord and pillar mining method with wide pillars supporting the rocks above.[248]

[243] GM Ochieng, ES Seanego & OI Nkwonta "Impacts of mining on water resources in South Africa: A review" (2010) 5 *Scientific Research and Essays* 3351 3353.
[244] RL Hopkins, BM Altier, D Haselman, AD Merry & JJ White "Exploring the legacy effects of surface coal mining on stream chemistry" (2013) 713 *Hydrobiologia* 87 87-88.
[245] Also known as room and pillar.
[246] Zhu, W, L Chen, Z Zhou, B Shen & Y Xu "Failure propagation of pillars and roof in a room and pillar mine induced by longwall mining in the lower seam" (2019) 52 *Rock Mechanics and Rock Engineering* 1193 1194 & 1196; R Adams & PL Younger "A strategy for modeling ground water rebound in abandoned deep mine systems" (2001) 39 *Groundwater* 249 249-250.
[247] FA Steart "Strength and stability of pillars in coal mines" (1954) 54 *SAIMM* 309 309; Ngwenyama, PL, WW De Graaf and EP Preis "Factors and challenges affecting coal recovery by opencast pillar mining in the Witbank coalfield" (2017) 117 *J. S. Afr. Inst. Min. Metall.* 215 215-216.
[248] Figure drawn by Gary van der Heyde.

It is, however, likely that in the long-term, the suspended rocks will collapse, thus, rendering the land surface above the mine unsafe.[249] Studies have revealed that when coal, for example, is mined using the bord and pillar method, more coal is later extracted around the pillars and what is left behind is often not enough to support the overhead weight.[250] The collapse can also result from extensive surface fracturing and subsidence above the mine, causing serious harm to natural drainage patterns, which in turn causes waterlogging.[251] The effects of narrow pillars and surface fractures are illustrated below.

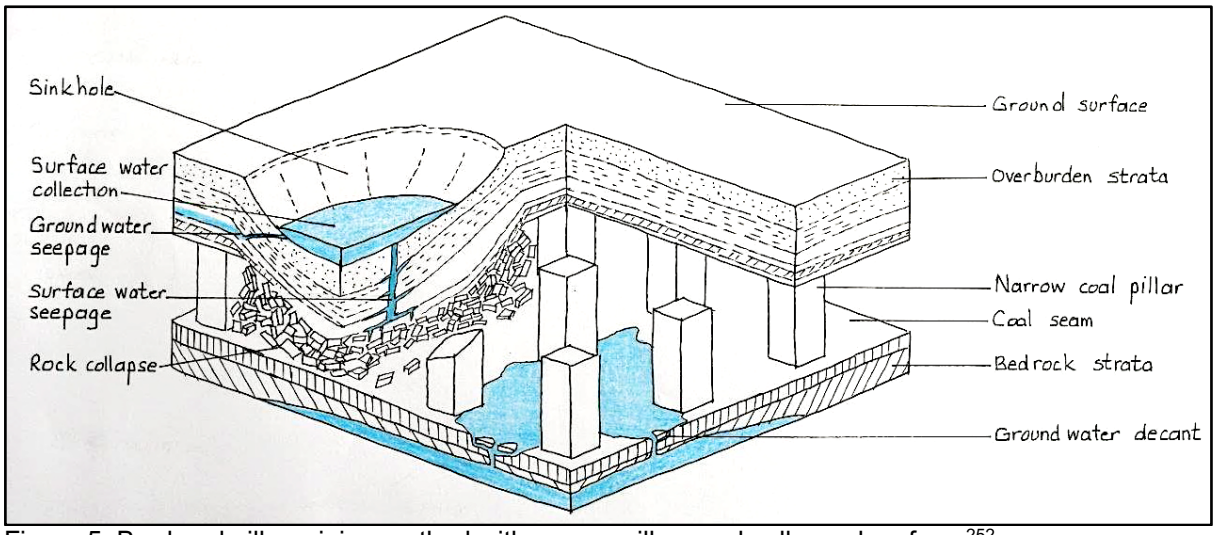

Figure 5: Bord and pillar mining method with narrow pillars and collapsed surface.[252]

The main impact of subsidence on groundwater, as illustrated in figure 4 above, is that it facilitates the infiltration of rainwater from the surface through openings and cracks to reach underground water.[253] Before reaching underground water, the infiltrated water gets mixed with pollutants resulting from mining.[254] This underground water

[249] McCarthy & Pretorius *Coal mining on the Highveld and its implications for future water quality* 57.
[250] Steart (1954) 54 *SAIMM* 312-313; H Wagner "Pillar design in coal mines" (1980) 80 *SAIMM* 37 38; E Ghasemi, M Ataei, K Shahriar, F Sereshki, SE Jalali & A Ramazanzadeh "Assessment of roof fall risk during retreat mining in room and pillar coal mines" (2012) 54 *International Journal of Rock Mechanics and Mining Sciences* 80 81.
[251] KB Singh "Causes and remedial measures of pot-hole subsidence due to coal mining" (2000) 59 *Journal of Scientific & Industrial Research* 280 282; JN van der Merwe "Effects of coal mining on surface topography in South Africa-updates and extensions" (2018) 118 *J. S. Afr. Inst. Min. Metall.* 777 777 & 781.
[252] Figure drawn by Gary van der Heyde.
[253] Bell et al. (2001) *International Journal of Coal Geology* 196
[254] Fernandez-Rubio & Lorca (1993) *Mine Water and the Environment* 108; P Sahu & RD Lokhande "An investigation of sinkhole subsidence and its preventive measures in underground coal mining" (2015) 11 *Procedia Earth and Planetary Science* 63 67.

becomes highly polluted and eventually forms AMD.[255] Unchecked AMD will contaminate groundwater further, and when it eventually overflows or decants, into the surrounding environment, it presents a serious threat to communities and biodiversity.[256] Subsidence can also result in the formation of lakes, which may further accumulate polluted waters.[257] Water from such lakes can infiltrate into underground mines and cause flooding, causing it to overflow with pollutants.[258]

The longwall mining method allows equipment such as hydraulic roof supports to be used while mining as illustrated in the figure below.

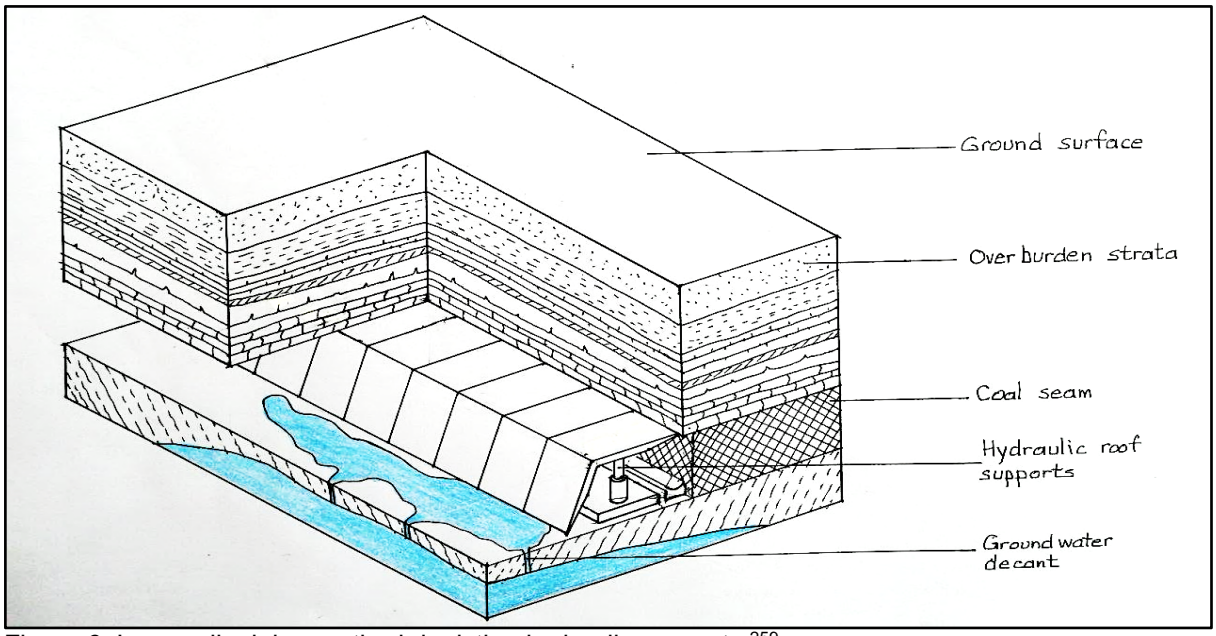

Figure 6: Longwall mining method depicting hydraulic supports.[259]

The main concern with this method is that supports for the roof are eventually moved forward as mining advances.[260] Once minerals are entirely extracted, the mine roof is

[255] Fernandez-Rubio & Lorca (1993) *Mine Water and the Environment* 108; JM McElfish, AE Beier & Environmental Law Institute *Environmental Regulation of Coal Mining: SMCRA's Second Decade* (1990) 132.
[256] Mhlongo & Amponsah-Dacosta (2015) *International Journal of Mining, Reclamation and Environment* 282.
[257] FG Bell, TR Stacey & DD Genske "Mining subsidence and its effect on the environment: some differing examples" (2000) 40 *Environmental Geology* 135 143.
[258] C Wolkersdorfer *Water Management at Abandoned Flooded Underground Mines: Fundamentals, Tracer Tests, Modelling, Water Treatment* (2008) 281-282.
[259] Figure drawn by Gary van der Heyde.
[260] US Office of Coal, Nuclear, Electric & Alternate Fuels *Longwall Mining* (1995) vii; N Bilgin, H Copur, C Balci & D Tumac *Strength, Cuttability, and Workability of Coal* (2019) 170-176.

left suspended.[261] With the overlying rocks left unsupported, the rocks are susceptible to fractures in the roof as shown in the figure below.

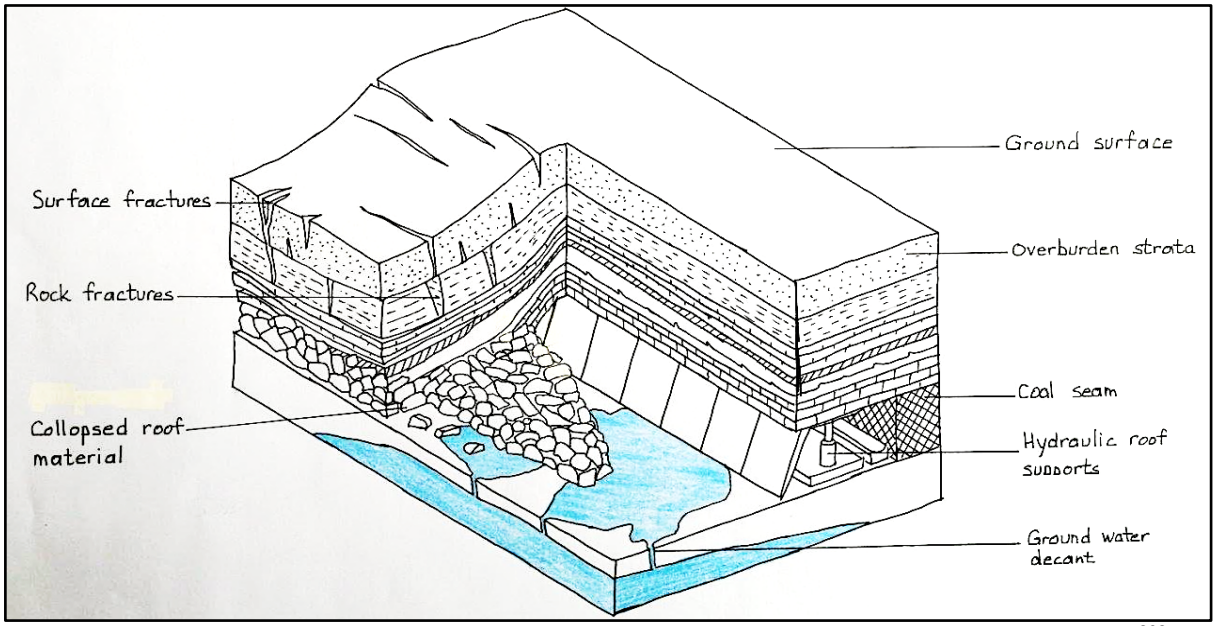

Figure 7: Longwall mining method with collapse roof due to the withdrawal of hydraulic supports.[262]

Fractures, as illsutrated in figure 6 above, can go as far as the earth's surface.[263] Like the bord and pillar method, the longwall method leads to subsidence, lake formation and infiltration of surface water, as well as AMD underground.[264]

Depending on the type of mineral mined and the existing deposits, the operational phase of a mine can last for thirty years or more.[265] Once operations cease, the closure and rehabilitation of mine sites must commence, to eliminate or mitigate water pollution which occured during the operational phase. The following discussion highlights the role of mine closure in the promotion of water sustainability in the mining sector.

[261] Bilgin et all *Strength, Cuttability, and Workability of Coal* 171.
[262] Figure drawn by Gary van der Heyde.
[263] McCarthy & Pretorius *Coal mining on the Highveld and its implications for future water quality* 57.
[264] Q Zhang & DL López "Use of Time Series Analysis to Evaluate the Impacts of Underground Mining on the Hydraulic Properties of Groundwater of Dysart Woods, Ohio" (2019) *Mine Water and the Environment* 566 566-567.
[265] RD Krause & LG Synman *Rehabilitation and Mine Closure Liability: An Assessment of the Accountability of the System to Communities* (2014) Proceedings of the 9th International Conference of Mine Closure 1.

2.2.5 Effect of Mine Closure and Rehabilitation on Water Sustainability

A mine's life cycle is only considered completed once the mine operation ceases and the site is rehabilitated, with a closure certificate issued for that purpose.[266] The term 'mine closure' refers to the point in a mine's life cycle at which the operational phase has come to an end, thus, giving way for the mine rehabilitation phase to begin.[267] Mine closure or rehabilitation processes are intended to protect the environment. However, failure or improper implementation of such processes, especially rehabilitation, present serious environmental risks, including water pollution.[268]

Mine closure and rehabilitation, and water protection are best achieved when a proper plan is in place and implemented progressively as the mine operations draw to an end.[269] The plan is likely to work best when time is taken for planning, monitoring and trials, as well as when funds are set aside to finance the implementation of the closure and rehabilitation plan.[270]

Mine closure seeks to put an end to a mine's operational phase. The said closure may be permanent or temporary and may lead to a programme of care and maintenance, as explained in Chapter Six. Mine rehabilitation, on the other hand, refers to the restoration of the post-mined landscape to a state suitable for future use of the land or area.[271] A proper rehabilitation process should be able to avoid water pollution as neighbouring communities' well-being is often intertwined with a successfully rehabilitated mine.[272]

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[266] JD Wells, LH Van Meurs, MA Rabie, GF Joubert, F Moir & J Russel "Terrestrial minerals" in HA Strydom & ND King (eds) *Environmental Management in South Africa* 2nd ed (2009) 513 552 & 554.
[267] Australia Department of Industry, Tourism and Resources *Mine Closure and Completion: Leading practice sustainable development program for the mining industry* (2006) 1, 5 & 10.
[268] D Limpitlaw, M Aken, H Lodewijks & J Viljoen *Post-mining rehabilitation, land use and pollution at collieries in South Africa* (2005) South African Institute of Mining and Metallurgy 7.
[269] 9.
[270] J Vandenberg, C McCullough and D Castendyk *Key Issues in Mine Closure Planning Related to Pit Lakes* (2015) In *Agreeing on Solutions for more Sustainable Mine Water Management—Proceedings of the 10th ICARD & IMWA Annual Conference* 3*;* DJ Hutchinson, C Phillips & G Cascante "Risk considerations for crown pillar stability assessment for mine closure planning" (2002) 20 *Geotechnical and Geological Engineering* 41 43-44; D Limpitlaw "Mine closure as a framework for sustainable development" (2004) *Sustainable Development Practices on Mine Sites – Tools and Techniques* 1 4.
[271] Limpitlaw et al. *Post-mining rehabilitation,* 2.
[272] Australia Department of Industry, Tourism and Resources *Mine Closure and Completion:* 5-6.

The purpose of mine closure and rehabilitation is to avoid mines being abandoned and thus causing long-term detrimental environmental concerns such as water pollution.[273] Such issues also emerge when mine closure and rehabilitation are not addressed appropriately.[274] Effective closure and rehabilitation of mines is required to ensure access to future resources like clean water for communities in which mine operation took place.[275] To achieve a meaningful closure and rehabilitation, those responsible for this process have to pursue it as an ultimate task that must be completed to ensure environmental sustainability as a whole and water protection in particular.[276] Mine closure and rehabilitation is also required to be carried out in an organised and effective manner, to avoid a situation where a former mine site may continue to be hazardous or could be a source of pollution in years to come.[277]

Therefore, the primary objective of a mine completion process is to avoid or mitigate the adverse and long-term effects of mining, which could be environmental and socio-economical.[278] The process is also aimed at guaranteeing resources, including water without which humanity cannot survive.[279] Failure to rehabilitate a mine site properly can result in both underground and surface water staying contaminated long after a mine shutdown.[280] This suggests that mining can cause negative health and environmental effects during extraction, processing and or waste storage or discarding, and even beyond mining.[281] Hence, water pollution has to be taken seriously by decisionmakers.[282]

The nature of mining is a constant threat to water resources. The actual direct and indirect impacts of mining are discussed below. Highlighting such impacts helps to understand the extent to which various players and phases of the mining sector are responsible for water pollution in the South African mining sector. The discussion in

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[273] D Laurence "Optimisation of the mine closure process" (2006) 14 *Journal of Cleaner Production* 285 286.
[274] Limpitlaw et al. *Post-mining rehabilitation,* 7.
[275] Cronje & Van Vyk "Corporations, communities and impact: The case of coal" in *Revisiting Environmental and Natural Resource Questions in Sub-Saharan Africa* 32.
[276] R Worrall, D Neil, D Brereton & D Mulligan "Towards a sustainability criteria and indicators framework for legacy mine land" (2009) 17 *Journal of Cleaner Production* 1426 1427-1428.
[277] S 24 NEMA.
[278] Worrall et al. (2009) *Journal of Cleaner Production* 1428.
[279] Australia Department of Industry, Tourism and Resources *Mine Closure and Completion:* 1.
[280] Akcil & Koldas (2006) *Journal of Cleaner Production* 1141 & 1142.
[281] 1142.
[282] M Campbell, V Nel & T Mphambukeli "eMalahleni" in L Marais, E Nel & R Donaldson (eds) *Secondary Cities and Development* (2016) 63 67.

the following two sections also highlights the extent of the effectiveness of the South African environmental legal framework in controlling water pollution in the mining sector.

3 Mine Water Pollution in South Africa as a Legacy of Mining

The impacts of mining on water resources vary from one phase of a mine's life cycle to another. As highlighted above, such impacts are less significant during the prospecting and construction phase, as compared to the extractive and closure phase.[283] The majority of adverse effects associated with mining result from both operating and abandoned mines.[284] These effects are easily visible across South Africa, in areas where mining operations are ongoing or have taken place previously.

A 2015 study by Maya et al.[285] highlighted how some communities have become environmentally vulnerable due to decades of mining. The study illustrated the extent to which coal-mining is responsible for the enrichment and accumulation of heavy metals in the soil around eMalahleni,[286] confirming that there was a strong presence of heavy metals in the soil, including in residential areas.[287] The most important metals confirmed, regarding concentration, were iron (Fe), nitrate (Ni), copper (Cu), vanadium (V) and chromium (Cr) ore.[288] The concentration levels of such metals ranged from low to high, with some like Ni, Cr, V and cobalt being above the permissible levels in South Africa.[289] The presence of those metals is disturbing as they are elements of AMD, as well as likely to contaminate water resources.[290] These metals are therefore a persistent threat to water resources, both underground and surface.

As far as underground water pollution is concerned, various factors are contributors, including the presence of the metals named above. Contact between such metals and

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[283] Glazewski *Environmental law in South Africa* 456.
[284] GJ Stander, MR Henzen & JW Funke "The disposal of polluted effluents from mining, metallurgical and metal finishing industries, their effects on receiving water and remedial measures" (1970) *SAIMM* 95 95-97; Spitz, K & J Trudinger *Mining and the Environment: From Ore to Metal* 2nd ed (2019) 741-742.
[285] M Maya, C Musekiwa, P Mthembi & M Crowley "Remote sensing and geochemistry techniques for the assessment of coal mining pollution, Emalahleni (Witbank), Mpumalanga" (2015) 4 *South African Journal of Geomatics* 174.
[286] 176.
[287] 174.
[288] 185.
[289] 178.
[290] PA Mays & GS Edwards "Comparison of heavy metal accumulation in a natural wetland and constructed wetlands receiving acid mine drainage" (2001) 16 *Ecological Engineering* 487 487 & 499.

water is enough to cause pollution, including AMD.[291] Such contact is facilitated by surface water infiltrating into the soil, very often through cracks which occur at times during mine operations.[292] Underground water pollution also occurs when existing underground water comes in contact with contaminants or pollutant waste produced during underground mining.[293] Such contamination also occurs when abandoned underground mines get flooded. It has been reported that mine-polluted groundwater in areas across South Africa has a high concentration of total dissolved solids and low pH value.[294] The pH value helps to determine the level of hydrogen and hydroxyl ions in water. The pH levels vary from zero to 14, with seven being neutral, while any pH below seven is a strong indication that the water is acidic and thus a health hazard.[295]

Surface water pollution can be caused by surface and underground mining. In terms of surface mining, metals and other contaminants are either discharged into water bodies or transported by rainwater.[296] Underground mining causes surface water pollution when underground mines are flooded due to rain or rising levels of underground water in abandoned mines.[297] Flooding leads to an overflow of water, allowing pollutants to cause soil pollution and pollution of nearby water bodies.[298] The chances of an overflow occurring are exacerbated by the collapse of suspended rocks which can either cause fractures on the surface or cause the surface to subside, resulting in the infiltration of rainwater or other forms of surface water easy.[299] A test

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[291] Mhlongo & Amponsah-Dacosta (2015) *International Journal of Mining, Reclamation and Environment* 282.
[292] Bell et al. (2001) *International Journal of Coal Geology* 196.
[293] S-q LIU, J-g Li, M Mei & D-l Dong "Groundwater pollution from underground coal gasification" (2007) 17 *Journal of china University of Mining and Technology* 467 469.
[294] E Sakala, F Fourie, M Gomo, H Coetzee & L Magadaza *Specific groundwater vulnerability mapping: Case study of acid mine drainage in the Witbank Coalfield, South Africa* (2016) *Proceedings of the 6th IASTED International Conference on Environment and Water Resource Management, AfricaEWRM* 98; J Knight "Water resources in South Africa" in J Knight & CM Rogerson (eds) *The Geography of South Africa: Contemporary Changes and New Directions* (2018) 91 95; AAJ Naudé *A Methodology to Quantify the Groundwater Impacts of Mega-Tailings Dams for the Gold Mining Industry, South Africa* Msc Thesis, North-West University (2016) 2 & 19.
[295] WJ Deutsch & R Siegel *Groundwater Geochemistry: Fundamentals and Applications to Contamination* (1997) 189.
[296] AT Lima, K Mitchell, DW O'Connell, J Verhoeven & P Van Cappellen "The legacy of surface mining: Remediation, restoration, reclamation and rehabilitation" (2016) 66 *Environmental Science & Policy* 227 231.
[297] Mhlongo et al. (2018) *Journal of Cleaner Production* 447.
[298] SA Foulds, PA Brewer, MG Macklin, W Haresign, RE Betson & SME Rassner "Flood-related contamination in catchments affected by historical metal mining: an unexpected and emerging hazard of climate change" (2014) 476 *Science of the Total Environment* 165 176-177; Wolkersdorfer *Water Management at Abandoned Flooded Underground Mines:* 52.
[299] Bell et al. (2001) *International Journal of Coal Geology* 196.

conducted on pools of water in eMalahleni showed that the water pH was 2, which is purely acidic water.[300] Similarly, instances of mine water problems in South Africa range from AMD witnessed in the Blesbokspruit water catchments, Wonderfonteinspruit and the West Rand in Johannesburg.[301]

The nature of mining leads to a high production of wastes, which are serious threats to water resources.[302] Water pollution is aggravated by wastewater used in mining processes, which finds its way either into underground water or directly into freshwater resources like streams, rivers and lakes.[303]

Water pollution in South Africa is also caused by mine tailings and residue, which are more likely to pollute water resources when they come into contact with such resources, possibly following rainfall.[304] Therefore, the concentration of heavy metals in water is generally very high.[305] Mine residue leads to pollution when its toxic elements are transported by runoff water into freshwater sources or lakes following rainfall.[306] The combination of the above issues relating to the contamination of ground and surface waters in South Africa often facilitate the seepage of AMD.[307] The seepage of AMD implies the flow of mine-polluted water from mine sites or from abandoned and contaminated mines to uncontaminated sites and areas.[308]

The above discussion points to the fact that communities are either residing on land above polluted waters or are surrounded by such waters. This is possible since polluted water from surface and underground mines can move in different directions through fractures for example. This possibility is more evident in the Johannesburg area where AMD has been a major environmental issue of concern and is described

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[300] M Kardas-Nelson "Mpumalanga's not-so-clean coal" (29-11-2010) *National* <http://mg.co.za/article/2010-11-29-mpumalangas-notsoclean-coal> (accessed 07-11-16).
[301] L Fyffe, H Coetzee & C Wolkersdorfer "Cost Effective Screening of Mine Waters Using Accessible Field Test Kits—Experience with a High School Project in the Wonderfonteinspruit Catchment, South Africa" in BJ Merkel & A Arab (eds) *Uranium - Past and Future Challenges: Proceedings of the 7th International Conference on Uranium Mining and Hydrogeology* (2015) 565 570.
[302] Naudé *A methodology to quantify the groundwater impacts of mega-tailings dams* iii.
[303] iii.
[304] Liphadzi & Vermaak (2017) *Journal of Cleaner Production* 609.
[305] ME Doyle, CE Steinhart & BA Cochrane *Food Safety 1993* (1993) 314; C Kamunda, M Mathuthu and M Madhuku "Potential human risk of dissolved heavy metals in gold mine waters of Gauteng Province, South Africa" (2018) 10 *J. Toxicol. Environ. Health Sci.* 56-63.
[306] E Fosso-Kankeu, A Manyatshe & F Waanders "Mobility potential of metals in acid mine drainage occurring in the Highveld area of Mpumalanga Province in South Africa: Implication of sediments and efflorescent crusts" (2017) 119 *International Biodeterioration & Biodegradation* 661 662.
[307] Bell et al. (2001) *International Journal of Coal Geology* 195.
[308] Liphadzi & Vermaak (2017) 153 *Journal of Cleaner Production* 609.

as a potential disaster.[309] Consequently, the effect on communities must be considered. The following discussion highlights the direct and indirect effects that mine water pollution has on the South African society.

4 Implications of Mine-related Water Pollution for Communities

In 2010, the Mpumalanga coalfields were marked as an area in need of immediate intervention to find ways to prevent AMD from polluting freshwater resources.[310] Such intervention sought to mitigate or put an end to issues such as water pollution that were becoming more and more threatening to the wellbeing of communities.[311] Available data does not suggest that these interventions have been successful as 2016 research shows that the Vaal River continues to present signs of AMD caused by mine water pumped into the River.[312]

The direct consequence of mine-related water pollution is that it affects water for human consumption and recreational purposes,[313] including the pollution of dams, streams, rivers, lakes and underground water.[314] Failure by decisionmakers to ensure the protection of such sources would lead to scenarios like the one witnessed in the town of Carolina in Mpumalanga Province in 2012. Community members became aware that water supplied to their taps from the Boesmanspruit dam, which supplies the town with water, was not suitable for consumption.[315] Tests conducted revealed that not only was there a presence of some chemical elements and heavy metals but that they exceeded acceptable limits.[316] Consequently, an indication that the dam's water was possibly contaminated by nearby mines.[317]

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[309] T McCarthy *The Decanting of Acid Mine Water in the Gauteng City-Region: Analysis, Prognosis and Solutions* (2010) vii; K Liebenberg, A Smit, S Coetzee & A Kijko "A GIS approach to seismic risk assessment with an application to mining-related seismicity in Johannesburg, South Africa" (2017) 65 *Acta Geophysica* 645 645-646.
[310] Campbell et al. "eMalahleni" in *Secondary Cities and Development* 71.
[311] 71.
[312] Naidoo *Acid Mine Drainage in South Africa:* 62.
[313] Fosso-Kankeu et al. (2017) *International Biodeterioration & Biodegradation* 667; CD McCullough "Consequences and opportunities from river breach and decant of an acidic mine pit lake" (2015) 85 *Ecological Engineering* 328 328.
[314] McCullough (2015) *Ecological Engineering* 329 & 334.
[315] McCarthy & Humphries (2013) *S. Afr. J. Sci* 5-6.
[316] 1.
[317] 3.

Continuous exposure to the dangerous compounds and chemicals contained in mine-polluted water can lead to various health hazards.[318] Some known health issues associated with mine-polluted water in South Africa are the irritation of the mucous membranes and the eyes after children, in particular, swim in contaminated pools.[319] Community members have also reportedly had stomach cramps and skin irritations after drinking or being in contact with water believed to have been polluted by mines.[320] The health issues referred to here are especially caused by AMD water or water containing dissolved metal ions amongst other, identified scientifically in the Mpumalanga area.[321] So far, there seems to be no scientifically backed evidence of disastrous health issues such as death associated with mine water in South Africa.

However, there are strong indications that more life-threatening effects are likely to happen in areas like Johannesburg and Mpumalanga if AMD is not well managed.[322] Such health and life-threatening issues must not be taken lightly because they have reportedly occurred elsewhere in the world. A case study found that consumption by community members of water polluted by mining around the coalfields of West Virginia in the United States of America has resulted in disastrous health issues.[323] Such issues, as insisted by community members, include cancer and death associated with mine polluted water.[324] Environmental groups strongly argue that water pollution caused by mining in that area is responsible for several types of illnesses, including rare cancers and kidney stones in children.[325] It is also believed that water pollution in that instance has been the cause of premature deaths in that area.[326]

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[318] Mhlongo & Amponsah-Dacosta (2015) *International Journal of Mining, Reclamation and Environment* 279.
[319] Kardas-Nelson "Mpumalanga's not-so-clean coal".
[320] K Moeng "Community perceptions on the health risks of acid mine drainage: the environmental justice struggles of communities near mining fields" (2018) *Environment, Development and Sustainability* 1 13.
[321] Fosso-Kankeu et al. (2017) *International Biodeterioration & Biodegradation* 662.
[322] Moeng (2018) *Environment, Development and Sustainability* 18.
[323] AL Boyles, RB Blain, JR Rochester, R Avanasi, SB Goldhaber, S McComb, SD Holmgren, SA Masten & KA Thayer "Systematic review of community health impacts of mountaintop removal mining" (2017) 107 *Environment International* 163 166 & 170.
[324] Boyles et al. (2017) *Environment International* 163 166; R Schiffman *A troubling look at the human toll of mountaintop removal mining* (21-11-2017) <https://e360.yale.edu/features/a-troubling-look-at-the-human-toll-of-mountaintop-removal-mining> (accessed 15-08-2019).
[325] W Dizard "Coal mining's long legacy of water pollution in West Virginia" (2014) *Environment* <http://america.aljazeera.com/articles/2014/1/13/coal-pollution-miningwestvirginiamassey.html> (accessed 10-09-2018).
[326] W Dizard "Coal mining's long legacy of water pollution".

South Africa, as a water-scarce country, also relies heavily on the few existing freshwater resources for farming.[327] Unfortunately, in several areas around South Africa, farming is seriously threatened by water shortages, which is further exacerbated by water pollution resulting from mining practices.[328] Generally, after mining, the land surface above mined areas are rehabilitated and should be suitable for farming purposes.

However, in some cases, the underground mines are not properly rehabilitated.[329] Even if, and when, the best measures are taken towards proper rehabilitation, groundwater is already polluted, in addition to its aquifers being disturbed.[330] In such situations, it is not possible to obtain underground pollution-free water, which is much needed for plants' growth. This difficulty results in a shortage of drinking water for both livestock and humans, which might consequently lead to the need to bring water in from elsewhere.[331] Even so, it could be futile to do so as AMD can sterilise the soil.[332]

Farming is also affected when contaminated water is used for irrigation purposes. As indicated above, mine-polluted water contains sulphur, which is unsuitable for farming.[333] Even when the sulphur content is neutralised through water treatment before use, it still has the potential to either concentrate in the soil or make its way into groundwater once more.[334] Alternatively, the sulphate-polluted water can accumulate

[327] MR Jones, A Singels & AC Ruane "Simulated impacts of climate change on water use and yield of irrigated sugarcane in South Africa" (2015) 139 *Agricultural Systems* 260 187.
[328] Matenga & Gumbo "An assessment of the social impact of acid mine drainage on the West Rand, South Africa: Towards responsive mining and sustainable cities on the African continent" in *Management and Mitigation of Acid Mine Drainage in South Africa: Input for Mineral Beneficiation in Africa* 72.
[329] M Mujuru, SS Mutanga & Z Dyosi "The formation of acid mine drainage" in M Mujuru & SS Mutanga (eds) *Management and Mitigation of Acid Mine Drainage in South Africa: Input for Mineral Beneficiation in Africa* (2016) 27 29.
[330] T Gonah "Impact of acid minde drainage on water resources in South Africa" in M Mujuru & SS Mutanga (eds) *Management and Mitigation of Acid Mine Drainage in South Africa: Input for Mineral Beneficiation in Africa* (2016) 41 50.
[331] B Usher & PD Vermeulen "The impacts of coal and gold mining on the associated water resources in South Africa" in Y Xu & B Usher (eds) *Groundwater Pollution in Africa* (2006) 301 305.
[332] Limpitlaw et al. *Post-mining rehabilitation,* 6.
[333] JJM Geurts, JM Sarneel, BJC Willers, JGM Roelofs, JTA Verhoeven & LPM Lamers "Interacting effects of sulphate pollution, sulphide toxicity and eutrophication on vegetation development in fens: a mesocosm experiment" (2009) 157 *Environmental pollution* 2072 2072-2073.
[334] Tiwary (2001) *Water, Air, and Soil Pollution* 187.

in the soil and transform the area into an unsuitable space for plants.[335] This necessarily has a long-term adverse effect on agricultural productivity.[336]

Plants are also likely to become contaminated because of heavy metal uptake, which renders such plants a health hazard to humans who consume them.[337] Such is an indication that the effects of mining on the South African agricultural sector are considerable and irreversible and thus, a threat to food security.[338] Heavy metal uptake can also become life-threatening. A case study in China found that inhabitants of villages around a mine experienced high rates of cancer followed by a series of deaths.[339] Such high rates resulted from consuming crops grown on mine waste or irrigated with mine water.[340]

Another disastrous effect of mine-related water pollution is its impact on biodiversity. Since most mine-polluted water ends up in streams or water catchments, this has resulted in several occasions in the loss of important aquatic ecosystems.[341] Consequently, there have been reports of dead fish and other aquatic animals, as well as damage to vegetation.[342] Damage to vegetation implies both the possibility for wildlife and livestock to feed on unhealthy grass or to lack grass.[343] If the acidity and heavy metal content of polluted water keep rising, the aquatic species will continue to deplete.

5 Conclusion

This chapter has provided context to the analysis of the legal and governance issues expounded in Parts Three and Four of this thesis. This chapter has thus, highlighted mining practices and their effects on water resources. It is therefore established that mining historically contributed immensely to South Africa's economic development,

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[335] Ochieng et al. (2010) 5 *Scientific Research and Essays* 3351-3352; Naudé *A methodology to quantify the groundwater impacts of mega-tailings dams* 124.
[336] Naudé *A methodology to quantify the groundwater impacts of mega-tailings dams* 124.
[337] Ochieng et al. (2010) 5 *Scientific Research and Essays* 3351.
[338] U Human "Competition for land use-a threat to agriculture?" (2017) 3 *FarmBiz* 30 30-31.
[339] J Liao, Z Wen, X Ru, J Chen, H Wu & C Wei "Distribution and migration of heavy metals in soil and crops affected by acid mine drainage: public health implications in Guangdong Province, China" (2016) 124 *Ecotoxicology and Environmental Safety* 460 460.
[340] 461.
[341] Fosso-Kankeu et al. (2017) *International Biodeterioration & Biodegradation* 669.
[342] McCarthy & Pretorius *Coal mining on the Highveld and its implications for future water quality* 60.
[343] K Venkateswarlu, R Nirola, S Kuppusamy, P Thavamani, R Naidu & M Megharaj "Abandoned metalliferous mines: ecological impacts and potential approaches for reclamation" (2016) 15 *Reviews in Environmental Science Bio/Technology* 327 328 & 335.

notably to the country's GDP.[344] Thus, new mining projects often create expectations on the part of local communities, such as local economic development, job creation and investment in local social infrastructure.[345] As government awards new mining licenses, part of its expectations is positive impacts of mining, including local socio-economic development.[346]

Whatever the benefits of mining projects, this thesis argues that the environment must be protected to safeguard communities' environmental needs.[347] Specifically, the availability of safe water resources must be ensured. Water sustainability in the South African mining sector is promoted through environmental governance, guided by good environmental legislation, as explained in Chapters Four and Six. South Africa undoubtedly has some of the most inclusive and progressive instruments for environmental protection, as discussed in Chapter six.[348] The discussion in this chapter, however, points to the fact that mining remains a real threat to water resources in South Africa.[349]

Water resources are threatened due to South Africa being home to many mines, both operational and abandoned.[350] The existence of those mines, to some extent, explains the current trend of water pollution in the mining industry.[351] Issues related to water pollution have become very common in South Africa over the years, and it is now obvious that mining is one of the main causes of the said pollution.[352] As highlighted above the impacts that mining has on water resources is caused by various practices

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[344] CM Rogerson "Mining enterprise, regulatory frameworks and local economic development in South Africa" (2011) 5 *African Journal of Business Management* 13373 13375; Naidoo *Acid Mine Drainage in South Africa:* 31-32.
[345] GT Maluleke & L Pretorius "Modelling the impact of mining on socio-economic infrastructure development-a system dynamics approach" (2016) 27 *South African Journal of Industrial Engineering* 66 74-75; RC Stedman, JR Parkins & TM Beckley "Resource dependence and community well-being in rural Canada" (2004) 69 *Rural Sociology* 213 213-214.
[346] Hamann (2004) 28 *Natural Resources Forum* 283.
[347] Cronje & Van Vyk "Corporations, communities and impact: The case of coal" in *Revisiting Environmental and Natural Resource Questions in Sub-Saharan Africa* 32.
[348] M Van der Linde & L Feris (eds) *Compendium of South African Environmental Legislation* 2nd ed (2010) 5.
[349] T Madihlaba "Environmental Justice in South Africa" in D.A. McDonald (ed) *Environmental Justice in South Africa* (2002) 156 156; Simpson et al (2019) *Frontiers in Environmental Science* 4.
[350] Stander et al. (1970) *SAIMM* 95.
[351] Fyffe et al. "Cost Effective Screening of Mine Waters Using Accessible Field Test Kits—Experience with a High School Project in the Wonderfonteinspruit Catchment, South Africa" in *Uranium - Past and Future Challenges: Proceedings of the 7th International Conference on Uranium Mining and Hydrogeology* 570.
[352] Mhlongo et al. (2018) *Journal of Cleaner Production* 447.

which take place following different methods and at different phases, thus, having varying impacts on water resources.[353]

One major consequence of mine-related water pollution, as established in this chapter, is its effect on human life.[354] Communities members' health is under the risk of being affected when they consume water polluted with heavy metals.[355] Farming, which is an essential component of South Africa's economy and the key to food security is under constant threat in parts of the country where mining practices occur.[356] Soils are rendered less productive due to soil contamination caused by mine-contaminated water infiltrating from topsoil or rising from underground mines.[357] Similarly, polluted water adversely affects biodiversity, thus, causing the death of fishes in streams and destroying vegetation, which serves as livestock feed, therefore, further impacting food security negatively.[358]

The effects of mining practices and the rate of water pollution highlighted in this chapter lead to questions regarding the effectiveness of the environmental legal framework in terms of achieving water sustainability in the mining sector. Such questions as analysed in Chapter Eight highlight the role or efficiency of the decisionmakers charged with the responsibility to oversee the implementation of environmental legal provisions. Provisions, in this case, being specifically those intended to promote good environmental governance to achieve sustainable water resources in the mining sector. Those provisions are analysed in Part three of this thesis. This thesis argues that safe water resources can be achieved in the South African mining sector through effective legal promotion of environmental sustainability. The said promotion requires an understanding of the concept of sustainability for informed decision making. Thus, the concept of sustainability as one of the core concepts informing discussions in this thesis and susceptible to inform environmental decision-making processes is discussed in the next chapter.

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[353] See section 2.2 of this chapter.
[354] See section 4 of this chapter.
[355] Liao et al. (2016) *Ecotoxicology and environmental safety* 460.
[356] Matenga & Gumbo "An assessment of the social impact of acid mine drainage on the West Rand, South Africa: Towards responsive mining and sustainable cities on the African continent" in *Management and Mitigation of Acid Mine Drainage in South Africa: Input for Mineral Beneficiation in Africa* 72.
[357] As explained in the previous section.
[358] As highlighted in the previous section.

CHAPTER THREE: UNDERSTANDING ENVIRONMENTAL SUSTAINABILITY IN THE MINING SECTOR

1 Introduction

The process of balancing the depletion of natural resources with the degradation of the environment is known as the pursuit of "environmental sustainability".[359] One goal of environmental sustainability is to mitigate the impact of issues such as water pollution caused by human activities, including mining.[360] In essence, the concept includes the pursuit of means to reduce and avoid environmental pollution.[361]

This chapter aims to explain what "sustainability" as a concept entails. In doing so, environmental sustainability, in general, and its implication in the mining sector, more specifically, are discussed. This chapter starts with a discussion of the concept of sustainability. It discusses the propositions on which environmental sustainability is founded.

Further, focus is placed on the factors motivating the achievement of environmental sustainability in the South African mining sector. The aim is to underline key sustainability targets that can be realised while practising environmentally sustainable mining. The intention is to highlight the important role that the achievement of sustainability can play for the provision of present water needs, as well as how it can preserve water resources for future needs.

2 What is Sustainability?

The understanding of the term "sustainability" remains a complex issue.[362] Some argue that the concept has no clear meaning, as there is no commonly agreed definition of the concept.[363] It is further argued that sustainability lacks a common

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[359] A Dobson *Justice and the Environment: Conceptions of Environmental Sustainability and Theories of Distributive Justice* (1998) 60; R Dubey, A Gunasekaran, SJ Childe, T Papadopoulos, Z Luo, SF Wamba & D Roubaud "Can big data and predictive analytics improve social and environmental sustainability?" (2019) 144 *Technological Forecasting and Social Change* 534 534-535.

[360] FP Carvalho "Mining industry and sustainable development: time for change" (2017) 6 *Food and Energy Security* 61 71-72.

[361] DA Mazmanian & ME Kraft "The three epochs of the environmental movement" in DA Mazmanian & ME Kraft (eds) *Toward Sustainable Communities: Transition and Transformations in Environmental Policy* 2nd ed (2009) 3 23.

[362] CL Parker, JD Rhodes & BS Schwartz "Sustainability and health" in H Frumkin (ed) *Environmental Health: From Global to Local* 3 ed (2016) 59 71-72.

[363] J Morelli "Environmental sustainability: A definition for environmental professionals" (2011) 1 *Journal of Environmental Sustainability* 1 2; W Leal Filho "Dealing with misconceptions on the concept of

criterion by which it can be measured.[364] Nonetheless, our dependence on a healthy environment for survival requires constant protection of natural resources, including water.[365] Such resources are best protected when one understands - at least to some extent - what achieving a sustainable environment entails. The following discussion attempts to explain the sustainability concept based on scientific findings, as well as the concept's commonly used definitions. The concept is discussed from its early conceptions, leading up to how it is generally understood or accepted today.

2.1 Early Approaches to Sustainability

Concern over the wellbeing of the environment is not a modern phenomenon.[366] "Sustainability" as a concept has developed over a long period, as the result of rising societal and environmental concerns.[367] Ancient civilisations[368] harboured some environmental concerns,[369] but "sustainability" as a term is believed to have surfaced for the first time in the eighteenth century. In 1713, Von Carlowitz referred to the "*nachhaltende Nutzung"*, that is "sustainable use" of natural resources in the forestry sector specifically.[370] Von Carlowitz advocated for reducing the use of old trees while ensuring that enough young trees were planted and preserved for future consumption.[371] Though these ideas amongst others were not intended to preserve the environment,[372] they indirectly promoted environmental conservation.[373]

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sustainability" (2000) 1 *International journal of sustainability in higher education* 9 10; M Kane "Sustainability concepts: From theory to practice" in J Köhn, JM Gowdy, F Hinterberger & J van der Straaten (eds) *Sustainability in Question: The Search for a Conceptual Framework* (1999) 15 15; R Ciegis, J Ramanauskiene & B Martinkus "The concept of sustainable development and its use for sustainability scenarios" (2009) 62 *Engineering Economics* 28 29; D Santillo "Reclaiming the Definition of Sustainability (7 pp)" (2007) 14 *Environmental Science and Pollution Research - International* 60 62.

[364] Morelli (2011) *Journal of Environmental Sustainability* 2.

[365] CL Parker, JD Rhodes, and BS Schwartz "Sustainability and Health" in H Frumkin *Environmental Health: From Global to Local* (2016) 59 60.

[366] E Wilson "EL articles" (1880) 1 *National Environmental Law Review* 65 66.

[367] Wilson (1880) *National Environmental Law Review* 66; R-D Chang, J Zuo, Z-Y Zhao, G Zillante, X-L Gan & V Soebarto "Evolving theories of sustainability and firms: History, future directions and implications for renewable energy research" (2017) 72 *Renewable and Sustainable Energy Reviews* 48 48-49.

[368] Egyptian, Mesopotamian, Greek and Roman era.

[369] Pliny *Natural History: With an English Translation in ten Volumes. Vol. 1* (1938) 293; LJM Columella *On Agriculture: Book I-V* (1941) 3 & 5; MG Macklin & J Lewin "River stresses in anthropogenic times: Large-scale global patterns and extended environmental timelines" (2019) 43 *Progress in Physical Geography: Earth and Environment* 3 16-17.

[370] JL Caradonna *Sustainability: A History* (2014) 36.

[371] Caradonna *Sustainability:* 38; P Warde *The Invention of Sustainability: Nature and Destiny, c.1500–1870* (2018) 177.

[372] R Wright *A Short History Of Progress* (2004) 43.

[373] 105.

The Industrial Revolution era and the modern era discussed below brought with them another dimension in the development of the concept of sustainability, given the significant increase in the use of natural resources.[374] By the second part of the twentieth century, the terms "sustainability" or "sustainable" became frequently used and applied across various fields, including the field of environmental protection.[375] The expansion provided more opportunity to encourage and guide the preservation of natural resources, as understood today.[376]

2.2 Modern Understanding of the Sustainability Concept

By the twentieth century, mining had become an important economic driver in many parts of the world,[377] including South Africa.[378] Like timber harvesting, it had become necessary to seek ways to render mining environmentally sustainable.[379] Though mining started decades ago and its impacts were already highlighted during the Industrial Revolution, the environment was not perceived as threatened by mining activities; neither was water specifically seen to be as endangered as it is today.[380] Nonetheless, the impacts of mining highlighted in the previous era were a step towards advocating for environmental protection in attempts to guarantee humanity's wellbeing, amidst continuous practice of environmental-threatened activities such as mining.[381]

In the aftermath of the Second World War, many countries were busy rebuilding damaged infrastructure and economies.[382] Newly independent states were equally

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[374] RG Lee "Implications of contemporary community organization and social values for forest management on the residential/wild land interface" in GA Bradley (ed) *Land Use and Forest Resources in a Changing Environment: The Urban/forest Interface* (1984) 119 121; A Tepper & KJ Borowiecki "Accounting for breakout in Britain: The industrial revolution through a Malthusian lens" (2015) 44 *Journal of Macroeconomics* 219 224.

[375] SL Huang & CW Chen "A system dynamics approach to the simulation of urban sustainability" (1970) 70 *Transactions on Ecology and the Environment* 15 15-16.

[376] R Goodland "The concept of environmental sustainability" (1995) 26 *Annual Review of Ecology and Systematics* 1 6; Chang et al (2017) *Renewable and Sustainable Energy Reviews* 49.

[377] C Schmitz "The rise of Big Business in the World copper Industry 1870-1930" (1986) *Economic History Review* 392 392; IT Berend *An Economic History of Twentieth-Century Europe: Economic Regimes from Laissez-Faire to Globalization* (2016) 244.

[378] W Beinart *Twentieth-Century South Africa* (2001) 29 & 175.

[379] Caradonna *Sustainability:* 91.

[380] G Bridge "Contested terrain: mining and the environment" (2004) 29 *Annu. Rev. Environ. Resour.* 205 206.

[381] Caradonna *Sustainability:* 91.

[382] G Castillo *Rebuilding War-Torn States: The Challenge of Post-Conflict Economic Reconstruction* (2008) 22.

attempting to pursue the development of their young nations.[383] Mining was certainly one sector that many economies, especially developing nations depended on for economic development.[384] By the 1970s, environmental degradation was on the increase due to continuous harvesting of natural resources through poor practices, including mining.[385] It was around this period that the Environmental Movement[386] gained momentum in the United States of America as it demanded a clean and safe environment that was conducive to healthy living.[387] The Movement promoted the fight against pollution and is believed to have successfully lobbied the American Congress to take necessary measures to achieve cleaner air and water.[388] Due to poor environmental protection, a body of scholars presented sustainable behaviours as the means to improve environmental preservation against negative impacts of activities such as mining.[389] Sustainability was presented as a process through which healthy ecosystems and environments can be maintained.[390] Humans and other organisms could not afford to survive without such healthy ecosystems and environments.[391]

Having identified that economic development[392] was a main driver of environmental degradation; it became important to pursue development in a way that its impacts on the environment are limited.[393] "Sustainable development" was introduced to explain

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[383] M Coulson *The History of Mining: The Events, Technology and People Involved in the Industry that Forged the Modern World* (2012) 268.
[384] Coulson *The History of Mining:* 268; MEK Bakari *The Dilemma of Sustainability in the Age of Globalization: A Quest for a Paradigm of Development* (2017) 19.
[385] RE Dunlap "Trends in public opinion toward environmental issues: 1965–1990" (1991) 4 *Society & Natural Resources* 285 288.
[386] This movement was known as the "modern conservation movement" and it sought to promote environmental quality and ecology. See SP Hays "The environmental movement" (1981) 25 *Journal of Forest History* 219 219.
[387] Hays (1981) *Journal of Forest History* 219; S Finn and L O'Fallon "The emergence of environmental health literacy—from its roots to its future potential" (2017) 125 *Environmental Health Perspectives* 495 497.
[388] B Devall "Deep ecology and radical environmentalism" in RE Dunlap & AG Mertig (eds) *American Environmentalism: The US Environmental Movement, 1970-1990* (1992) 51 51.
[389] DR Lewis "Native Americans and the environment: a survey of twentieth-century issues" (1995) 19 *American Indian Quarterly* 423 437; C Slater "Amazonia edenic narrative" in W Cronon (ed) *Uncommon Ground: Rethinking the Human Place in Nature* (1996) 114 14-16; M Wackernagel & W Rees *Our Ecological Footprint: Reducing Human Impact on the Earth* (1996) 59.
[390] Lewis (1995) *American Indian Quarterly* 430-431; M Tost, M Hitch, V Chandurkar, P Moser and S Feiel "The state of environmental sustainability considerations in mining" (2018) 182 *Journal of Cleaner Production* 969 970.
[391] H Washington *Human Dependence on Nature: How to Help Solve the Environmental Crisis* (2013) i.
[392] The process by which the economy of a country is improved. See EB Barbier "The concept of sustainable economic development" (1987) 14 *Environmental Conservation* 101 101 & 107.
[393] E Goldsmith *A Blueprint for Survival* (1972); Tost et al (2018) *Journal of Cleaner Production* 969-970.

how a safer environment can be achieved amidst development that relied heavily on natural resources.[394] The aim was to introduce a solution on how to maintain human dependence on natural resources.[395]

Sustainable development emerged mainly to suggest the realisation of development, especially economic development, in ways that economic needs and their effects on natural resources such as water are well balanced.[396] By the 1980s, the term "sustainable development" as introduced by the UN,[397] became widely used and accepted.[398]

In 1987, the World Commission on Environment and Development tabled the Brundtland Report in which the first definition of "sustainability" was offered.[399] In terms of the report, "sustainability" or "sustainable development" implies development that ensures that the current earth's inhabitants use natural resources without hampering future generations' ability to enjoy the same equitably.[400] In essence, the report advocated for the possibility of simultaneously achieving "social equity, economic growth and environmental maintenance".[401] The report highlighted three pillars required to achieve sustainable development, as illustrated in the figure below.

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[394] D McNeill *The Concept of Sustainable Development* (2004) 26.
[395] Barbier (1987) *Environmental Conservation* 102-103; Carvalho (2017) *Food and Energy Security* 73.
[396] DH Meadows & Club of Rome *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind* (1972) 23; Carvalho (2017) *Food and Energy Security* 73.
[397] UN *Declaration of the United Nations Conference on the Human Environment Stockholm* (1972) Para 4; IUCN, UNEP & WWF *World Conservation Strategy: Living Resource Conservation for Sustainable Development* (1980) <https://portals.iucn.org/library/sites/library/files/documents/WCS-004.pdf> (accessed 14-11-2019); D Worster *The Wealth of Nature: Environmental History and the Ecological Imagination* (1993) 24.
[398] R Harding "Ecologically sustainable development: origins, implementation and challenges" (2006) 187 *Desalination* 229-230.
[399] A Du Plessis & JG Nel "An introduction" in A Du Plessis (ed) *Environmental Law and Local Government in South Africa* (2015) 3 7.
[400] WCED *Our Common Future* (1987) Ch 2.
[401] WCED *Our Common Future* Ch 2; A McKinnon "Environmental sustainability: A new priority for logistics managers" in A Mckinnon, M Browne, A Whiteing & M Piecyk (eds) *Green Logistics: Improving the Environmental Sustainability of Logistics* (2015) 3 4; R Gooodland *Environmenttally Susstainable Economic Development: Buildung on Brundtland* (1991) 9.

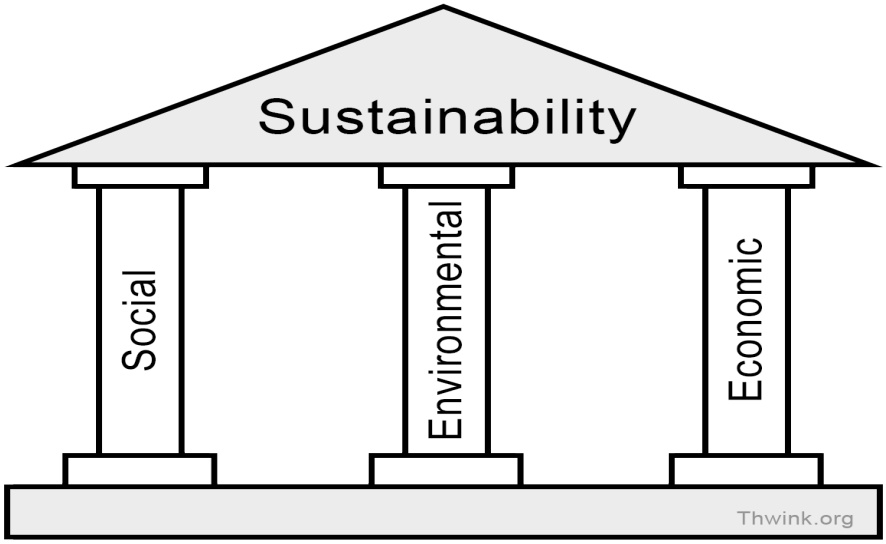

Figure 8: The three pillars of sustainability.[402]

The social pillar represents a society in which people share a common space and available resources even if they do not have a common goal.[403] In such a space, people are exposed to possibilities that can result in self-development.[404] Self-development in relation to natural resources refers to the ability of people to use available resources such as water in ways that contribute to their wellbeing.[405] In this instance, it is important that people have continuous access to water.

The economic pillar represents the "maintenance of natural capital",[406] such as forests, minerals, water, and air. This pillar also encompasses an economy with growth potential, which enables people and institutions to generate wealth,[407] without abusing the abovementioned resources.

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[402] Thwink.org "The three pillars of sustainability" <http://www.thwink.org/sustain/glossary/ThreePillarsOfSustainability.htm> (accessed 17-06-19).
[403] OECD *Society at a Glance 2009 OECD Social Indicators: OECD Social Indicators* (2009) 53.
[404] R Goodland & H Daly "Environmental sustainability: Universal and non-negotiable" (1996) 6 *Ecological Applications* 1002 1003; B Purvis, Y Mao & D Robinson "Three pillars of sustainability: In search of conceptual origins" (2019) 14 *Sustainability Science* 681 683-684.
[405] J Hagmann & E Chuma "Enhancing the adaptive capacity of the resource users in natural resource management" (2002) 73 *Agricultural systems* 23 30-31.
[406] M Wackernagel & WE Rees "Perceptual and structural barriers to investing in natural capital: Economics from an ecological footprint perspective" (1997) 20 *Ecological Economics* 3 10; N Duić, K Urbaniec & D Huisingh "Components and structures of the pillars of sustainability" (2015) 88 *Journal of Cleaner Production* 1 2.
[407] Goodland & Daly (1996) *Ecological Applications* 1003; Duić et al (2015) *Journal of Cleaner Production* 2.

The environmental pillar represents the preservation of biodiversity and natural resources that are essential for humankind's survival.[408] The environmental pillar is essential for the maintenance of the other pillars.[409] Thus, the existence of the social and economic pillars may be adversely affected if their effects on the environmental pillar are not well balanced.[410] Sustainability therefore implies the balancing of the effects of society and economic activities on the environment, to ensure a healthy environment for economic development and societal wellbeing.

The Brundtland Report was essentially concerned with human well-being and promoted equal access to natural resources for all.[411] The Report pointed to the fact that economic growth conflicted with environmental protection.[412] The conflict resulted from the fact that many countries, especially those with developing economies (including South Africa), relied on mining for economic growth.[413]

The tension is caused by the fact that the extraction of minerals is a threat to other valuable natural resources, such as water. Mine waste and chemicals used in the extraction process tend to pollute water sources.[414] As discussed in this chapter, the notion of sustainability applied to water protection in the mining sector seeks to address questions like why and how to prevent water pollution.[415] It also seeks to

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[408] R Kemp & P Martens "Sustainable development: how to manage something that is subjective and never can be achieved?" (2007) 3 *Sustainability: Science, Practice, & Policy* 5 6; IC Schutte *A Strategic Management Plan for the Sustainable Development of Geotourism in South Africa* Doctoral Thesis, North-West University (2009) 22.

[409] RB Gibson "Beyond the pillars: sustainability assessment as a framework for effective integration of social, economic and ecological considerations in significant decision-making" (2006) 8 *JEAPM* 259 261.

[410] Gibson (2006) *JEAPM* 264.

[411] Kane "Sustainability concepts: From theory to practice" in *Sustainability in Question: The Search for a Conceptual Framework* 17; S Anand & A Sen "Human development and economic sustainability" (2000) 28 *World Development* 2029 2034; J Lienert & P Burger "Merging capabilities and livelihoods: analyzing the use of biological resources to improve well-being" (2015) 20 *Ecology and Society,* http://dx.doi.org/10.5751/ES-07405-200220.

[412] Kane "Sustainability concepts: From theory to practice" in *Sustainability in Question: The Search for a Conceptual Framework* 16.

[413] J Martínez-Alier, U Pascual, F-D Vivien & E Zaccai "Sustainable de-growth: Mapping the context, criticisms and future prospects of an emergent paradigm" (2010) 69 *Ecological Economics* 1741 1743; C Sneddon, RB Howarth & RB Norgaard "Sustainable development in a post-Brundtland World" (2006) 57 *Ecological Economics* 253 254.

[414] TE Clevenger "Use of sequential extraction to evaluate the heavy metals in mining wastes" (1990) 50 *Water, Air, and Soil Pollution* 241 241; Fashola et al (2016) *IJERPH* 2 & 4

[415] GM Mudd "Sustainability reporting and water resources: A preliminary assessment of embodied water and sustainable mining" (2008) 27 *Mine Water and the Environment* 136 143.

address the reasons why water pollution should be managed or mitigated to balance the negative effects of mineral extraction.[416]

Although the definition of sustainable development contained in the Brundtland Report brought some clarity as to what "sustainability" may entail, it nonetheless triggered mixed reactions.[417] The pro-environmental stance of the definition was ground-breaking because it provided a better understanding of how sound environmental practices can be achieved.[418] The promoters of environmental protection saw the definition as a means to warn against economic activities that are not - or are less - environmentally friendly.[419]

Contrary to the pro-environmental perception above, the Brundtland Report's definition of sustainable development was perceived as flawed in several ways.[420] Three strong opposing arguments came mainly from countries outside of the developed West. These arguments, as discussed below, came specifically from the proponents of free-market economies and authors disagreeing with the inclusiveness of the sustainable development concept.[421]

Less-developed countries reportedly perceived sustainable development as an ideology introduced by the West to serve as a condition for continued aid from the West to developing countries.[422] The interpretation of the developing countries' was based on their fear that restricting certain activities for the sake of balancing development and environmental needs may mean no or less development.[423] Therefore, limiting the extraction of natural resources meant continuous expectation or reliance on foreign aid for development.[424] Less-developed countries also felt that

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[416] 143.
[417] SK Agarwal & PS Dubey *Environmental Controversies* (2002) 71.
[418] J Robinson "Squaring the circle? Some thoughts on the idea of sustainable development" (2004) 48 *Ecological Economics* 369 370.
[419] SM Lélé "Sustainable development: A critical review" (1991) 19 *World Development* 607 609; Barbier "The concept of sustainable economic development" 106; Robinson "Squaring the circle?" 376.
[420] Robinson "Squaring the circle?" 373; Lélé (1991) *World Development* 608.
[421] Agarwal & Dubey *Environmental Controversies* 72.
[422] C Mitcham "The concept of sustainable development: Its origins and ambivalence" (1995) 17 *Technology in Society* 311 23.
[423] A Angelsen *The Poverty—Environment Thesis: Was Brundtland Wrong?* (1997) Forum for Development Studies 151; H Hove "Critiquing sustainable development: A meaningful way of mediating the development impasse?" (2004) 1 *Undercurrent* 48 51.
[424] Hove (2004) *Undercurrent* 50-51.

if they limited the extraction of natural resources, their development might stagnate, thus, perpetuating the gap between developed and less-developed countries.[425]

Unlike the section of society that was more concerned about environmental preservation, promoters of the free-market system (capitalists) were likely to be less impressed by sustainable development policies.[426] Even though most natural resources are non-renewable,[427] they argued that future generations would be able to address growth and development issues via human ingenuity.[428] The free-market system is an economic term referring to a system in which the laws and forces of demand and supply are not controlled by the government.[429] Such laws and forces are not controlled by any authority with powers and monopoly to fix prices.[430] In a free-market system, goods and services are bought and sold without restriction.[431] Prices of goods and services are agreed on between the seller and the buyer.[432] It was argued that human knowledge is ever-growing, and technology is constantly improving.[433] Thus, it was not necessary to restrict the use or commercialisation of natural resources because future generations will be able to invent what they need for survival.[434]

Other criticisms related to the perception that Brundtland's definition of sustainable development is not sufficiently clear and inclusive.[435] Worster, for instance, argued that the term sustainable development was baseless since specific criteria for sustainability had not yet been formulated.[436] Lack of criteria suggested that there was

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[425] Mitcham (1995) *Technology in Society* 323.
[426] Hove (2004) *Undercurrent* 51.
[427] J Glazewski "The nature and scope of environmental law" in J Glazewski & L Du Toit (eds) *Environmental Law in South Africa* (2014) 1-1 1-16 to 1-17; T Kuhlman & J Farrington "What is sustainability?" (2010) 2 *Sustainability* 3436 3445.
[428] Du Pisani "Sustainable development " 93; JS Dryzek *The Politics of the Earth: Environmental Discourses* (2013) 156.
[429] KR Popper *The Open Society and Its Enemies* (1994) 817; RW Baker *Capitalism's Achilles Heel: Dirty Money and how to Renew the Free-Market System* (2005) 11-12.
[430] Baker *Capitalism's Achilles Heel:* 8-9.
[431] J Johanson & LG Mattsson "Interorganizational relations in industrial systems: A network approach compared with the transactions-cost approach" in G Thompson (ed) *Markets, Hierarchies and Networks: The Coordination of Social Life* (1991) 256 260; KM Hansen "Are free-market fiduciary media possible? On Credit intermediation, banking, and money production in the free market" (2020) 1.
[432] Baker *Capitalism's Achilles Heel:* 8-9.
[433] Dryzek *The Politics of the Earth:* 156.
[434] 156.
[435] A Jordan "The governance of sustainable development: taking stock and looking forwards" (2008) 26 *Environment and Planning C: Government and Policy* 17 18.
[436] Worster *The Wealth of Nature:*142-143.

a gap for promoters of economic growth and capitalists (mostly of the West) to exploit the concept of sustainable development to their advantage.[437] The exploitation meant interpreting and applying the ideology behind the concept in a way that suited the objectives of those for economic growth.[438] This thinking aligned with another argument that the Brundtland report's understanding of "needs" is flawed because needs change over time.[439] Therefore, one cannot assume that future needs will correspond to our present needs.[440] This stance ignores the fact that human need for resources like water is permanent and is, thus, not likely to change over time.[441]

It is also argued that "needs" do not necessarily mean the same thing in every region or culture.[442] What is needed in a given society to achieve sustainable development is not necessarily the same need in another society. For instance, whereas one (arid) country may need clean water resources to achieve sustainable development, the most pressing need for another might be material wealth.[443] Material wealth can be income generated by extracting and commercialising mineral resources. Very often, one of the direct consequences of enjoying the fruits of such wealth is water pollution.[444]

Even with all the controversies surrounding the concept of sustainable development, the Brundtland Report's definition is still often referred to when defining sustainability.[445] The importance of the definition rested in the fact that it was put together by a commission made up of members from different countries, thus indicating the commitment of people from different background to promote environmentally-friendly activities.[446] Another noteworthy aspect of the Report is the

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[437] 145.
[438] 145.
[439] M Redclift "Sustainable development (1987–2005): an oxymoron comes of age" (2005) 13 *Sustainable Development* 212 213.
[440] M Redclift "Sustainable development: needs, values, rights" (1993) 2 *Environmental Values* 3 8-9.
[441] Millennium Ecosystem Assessment *Ecosystems and Human Well-being: Wetlands and Water Synthesis* (2005) 12 & 15.
[442] Redclift (2005) *Sustainable Development* 213-214.
[443] 214.
[444] B Hopwood, M Mellor & G O'Brien "Sustainable development: mapping different approaches" (2005) 13 *Sustainable development* 38 48.
[445] RW Kates, TM Parris & AA Leiserowitz "What is sustainable development?" (2018) 47 *Environment: Science and Policy for Sustainable Development* 8 10; SK Florentine, P Graz, A Doronila, R Martin, K Dowling & N Fernando "Building suitable restoration approaches in the Brownfields" in S Devasahayam, K Dowling & MK Mahapatra (eds) *Sustainability in the Mineral and Energy Sectors* (2016) 227 231; S Dresner *The Principles of Sustainability* (2012) 39.
[446] WCED *Our Common Future* Annex 2.

fact that its environmental aspect of sustainability has received enormous attention regarding environmental protection against development.[447] The principal reason is that most natural resources are non-renewable.[448] Resources in this category cannot reinvent themselves, and should therefore not be abused.[449]

Similarly, though water is classified as a renewable resource, in times of severe drought or pollution, streams and underground water sources cannot automatically renew themselves. The failure to renew implies an "ecosystem collapse" which is a drastic decline or extinction of the ecosystem in a given area.[450] Therefore, water as a basic need at every level of society, be it for household or industrial needs, must be preserved in countries like South Africa where drought and pollution are problematic.[451]

When considering "sustainability" today, the UN Sustainable Development Goals (SDGs)[452] feature strongly. The SDGs replaced the Millennium Development Goals (MDGs).[453] The Millennium Declaration relating to MDGs urged member states to take necessary measures to counter the increasing threat of human activities to the environment.[454] Upon reaching the targeted deadline of 2015, and more still to be

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[447] MN Peterson, MJ Peterson & TR Peterson "Conservation and the myth of consensus" (2005) 19 *Conservation biology* 762 763-764; I Borowy *Defining Sustainable Development for Our Common Future: A History of the World Commission on Environment and Development (Brundtland Commission)* (2013) 88.

[448] Such resources are exhaustible, and even the portion that remains available can depreciate in quality. See WD Schulze "The optimal use of non-renewable resources: The theory of extraction" (1974) 1 *Journal of Environmental Economics and Management* 53 53 & 61; Suen, R and H Sriket *Sources of Economic Growth in Models with Non-Renewable Resources* (2019) *Working Paper No. 19 12* 8-9.

[449] E Neumayer "Scarce or abundant? The economics of natural resource availability" (2000) 14 *Journal of economic surveys* 307 309-310.

[450] LM Bland, JA Rowland, TJ Regan, DA Keith, NJ Murray, RE Lester, M Linn, JP Rodríguez & E Nicholson "Developing a standardized definition of ecosystem collapse for risk assessment" (2018) 16 *Frontiers in Ecology and the Environment* 29 29.

[451] HF Cook *The Protection and Conservation of Water Resources* 2 ed (2017) 119; P Mukheibir & D Sparks *Water Resource Management and Climate Change in South Africa: Visions, Driving Factors and Sustainable Development Indicators* (2003) Report for Phase I of the Sustainable Development and Climate Change project. Energy and Development Research Centre (EDRC), University of Cape Town 1 & 14.

[452] Adopted by 195-member countries on 25th September 2015.

[453] ICSU & ISSC *Review of Targets for the Sustainable Development Goals: The Science Perspective* (2015) Paris: International Council for Science 7.

[454] UN "Millennium Summit (6-8 September 2000)" <http://www.un.org/en/events/pastevents/millennium_summit.shtml> (accessed 14-10-18).

done to achieve its development goals, the UN opted for a new and inclusive agenda - the SDGs.[455]

Unlike the MDGs, the SDGs adopted a people-centred agenda, following a consultative process at a global scale, in terms of which civil society, academics, as well as the private sector were consulted.[456] Compared with the Brundtland Report, the SDGs broadened the scope of the sustainability concept.[457] The SDGs include seventeen goals in total, with each having "[s]pecific targets"[458] to be reached within fifteen years from the date of its inception.[459] The overall objective of the goals can be summarised into three primary goals: "to end poverty, protect the planet, and ensure prosperity for all".[460]

For the purposes of this thesis, goal number six titled: "clean water and sanitation",[461] requires specific attention. The achievement of sustainability in this context requires that everyone has access to clean water. The UN determined that the scarcity of clean water resources and poor-quality water resources "negatively impact food security" and "livelihood choices" for low-income families in particular.[462] One of the main factors affecting access to water and water quality is human activities,[463] including mining. The effect on water occurs especially when wastewater is discharged into freshwater sources, as well as into the sea.[464] In terms of goal six, one can conclude that water

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[455] S Kumar, N Kumar & S Vivekadhish "Millennium development goals (MDGS) to sustainable development goals (SDGS): Addressing unfinished agenda and strengthening sustainable development and partnership" (2016) 41 *IJCM* 1 2.

[456] Kumar et al. (2016) 41 *IJCM* 3; ME Tok, N Elbassiouny, S Samper & MS Showkath "United Nations Millennium Development Goals (UN MDGs) and the Arab Spring: Shedding light on the preludes" in H Besada, L McMillan Polonenko & M Agarwal (eds) *Did the Millennium Development Goals Work?: Meeting Future Challenges with Past Lessons* (2017) 359 382.

[457] N Kanie, S Bernstein, F Biermann & F Biermann "Introduction: Global governance through goal setting" in N Kanie & F Biermann (eds) *Governing Through Goals: Sustainable Development Goals as Governance Innovation* (2017) 1 7-8.

[458] There are 169 targets in total. See R Costanza, L Fioramonti & I Kubiszewski "The UN Sustainable Development Goals and the dynamics of well-being" (2016) 14 *Solutions* 20 20.

[459] UN *Sustainable Development Goals* (2017) <http://www.un.org/sustainabledevelopment/sustainable-development-goals/> (accessed 17-08-2019).

[460] UN *Sustainable Development Goals*.

[461] UN *Sustainable Development Goals*.

[462] UN "Goal 6: Ensure access to water and sanitation for all"; Costanza et al. "The UN Sustainable Development Goals and the dynamics of well-being" 20-21.

[463] T Yamada "Corporate water stewardship: Lessons from goal-based hybrid governance" in N Kanie & F Biermann (eds) *Governing Through Goals: Sustainable Development Goals as Governance Innovation* (2017) 187 201.

[464] D Banks, PL Younger, RT Arnesen, ER Iversen & SB Banks "Mine-water chemistry: the good, the bad and the ugly" (1997) 32 *Environmental Geology* 157 164; Mhlongo et al (2018) *Journal of Cleaner Production* 447-448

sustainability means conducting human activities in ways that continuously ensure the safety of freshwater sources. In other words, water sustainability means ensuring that everyone can always access clean water.[465]

From the above, one can deduce that "sustainability," analysed from an environmental perspective, is concerned with the relationship between humankind and natural resources.[466] It is also about human attitudes regarding the use of such resources. First, the enjoyment of resources means the direct use of resources such as water and air or the ability to derive wealth from resources like minerals.[467] Second, resources are to be enjoyed by humankind but without abusing natural resources like water.[468] Non-abuse of water resources ensures that humankind can maintain permanent well-being through continuous access to natural resources[469]

Sustainability, therefore, means that the environment and natural resources such as water are to be maintained rather than depleted or caused to depreciate in quantity and quality.[470] Resources such as water are a source of life-support as human life, and the ecosystem depend thereon. The pollution of such resources is therefore likely to limit access to it.[471] A way to ensure that natural resources are sustained properly is by monitoring the progress of sustainability scientifically from time to time while enforcing the legal framework consistently. The following discussion highlights principles through which sustainability can be achieved.

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[465] R Costanza & HE Daly "Natural capital and sustainable development" (1992) 6 *Conservation Biology* 37 39; RM Solow *Sustainability: An Economist's Perspective* (1991) 180; Mhlongo et al (2018) *Journal of Cleaner Production* 447.

[466] R Hueting "The Brundtland report: A matter of conflicting goals" (1990) 2 *Ecological Economics* 109 110; M Howes, L Wortley, R Potts, A Dedekorkut-Howes, S Serrao-Neumann, J Davidson, T Smith & P Nunn "Environmental sustainability: A case of policy implementation failure?" (2017) 9 *Sustainability* 2.

[467] Harding (2006) *Desalination* 230.

[468] Goodland (1995) *Annual Review of Ecology and Systematics* 2; GS Cumming & S von Cramon-Taubadel "Linking economic growth pathways and environmental sustainability by understanding development as alternate social–ecological regimes" (2018) 115 *Proceedings of the National Academy of Sciences* 9533 9534.

[469] M Sowman & R Wynberg "Governance, equity and sustainability in sub-Saharan Africa: An introduction to the discourse" in M Sowman & R Wynberg (eds) *Governance for Justice and Environmental Sustainability: Lessons Across Natural Resource Sectors in Sub-Saharan Africa* (2014) 1 10-11.

[470] Goodland (1995) *Annual Review of Ecology and Systematics* 6; Cumming & von Cramon-Taubadel (2018) *Proceedings of the National Academy of Sciences* 9536.

[471] Costanza & Daly (1992) *Conservation Biology* 36.

3 Principles of Sustainability

The main benefit of sustainability lies in the continuous availability of natural resources such as clean water.[472] The availability of sustainable water resources implies continuous access to fresh water by communities vulnerable to the adverse impacts of mining.[473] The realisation of a target like sustainability is most likely to be achieved when certain measures are put in place and observed.[474] A wide range of principles must be promoted to achieve water sustainability.

The following discussion outlines the principles that underlie the achievement of sustainability goals.[475] The discussion also underlines the implication of sustainability to South African communities that are vulnerable to mining impacts on freshwater resources. Even though there is an extensive list of environmental sustainability principles, this thesis focuses on the principles of integration, involvement, precaution, equity, continuity and integrity. These principles, coined by Cotter and Hannan,[476] better explain ways in which natural resources can be protected,[477] especially in the face of threats from human activities like mining. The principles also serve as guidelines to preserve natural resources, such as water, for the wellbeing of communities which are the most vulnerable to these negative impacts.[478] The principles best suit the context of this thesis, which focuses primarily on the protection or sustainability of a resource that is scarce, yet, threatened by pollution resulting from mining. The following discussion explains why and how the above-named principles can achieve the sustainability of water resources in the South African mining sector.

3.1 Principle of Equity within and Between Generations

The principle of equity can be intra-generational or intergenerational. Intra-generational equity refers to fair and equal access to opportunities among the same

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[472] Banks et al. (1997) *Environmental Geology* 170; I Dialga "A sustainability index of mining countries" (2018) 179 *Journal of Cleaner Production* 278 282.
[473] MA Montgomery, J Bartram & M Elimelech "Increasing functional sustainability of water and sanitation supplies in rural sub-Saharan Africa" (2009) 26 *Environmental Engineering Science* 1017 1019; S Sutton "Preliminary desk study of potential for self supply in sub-Saharan Africa" (2004) *WaterAid and the Rural Water Supply Network, London (October)* 1-2.
[474] Montgomery et al. "Increasing functional sustainability of water and sanitation supplies" 1022.
[475] AL Dahl "Achievements and gaps in indicators for sustainability" (2012) 17 *Ecological Indicators* 14 18.
[476] B Cotter & K Hannan *Our Community our Future: A Guide to Local Agenda 21* (1999) 171.
[477] 171.
[478] 12-13.

generation.[479] Intra-generational equity includes, for instance, equal distribution of resources between the present generation.[480] Intergenerational equity, on the other hand, refers to fair and equal distribution of resources between different generations - the present and future generations.[481] Intergenerational equity emphasises that the natural environment is a common good that belongs to all generations.[482] Common good means that the present generation must preserve the earth and its resources inherited from previous generations.[483] Future generations will need the earth with resources such as water that they can depend on for their wellbeing.[484] It is not disputed that future generations might benefit from current economic development.[485] Instead, such benefits might become less useful as a result of environmental degradation.[486]

The notion of equity concerning water protection means the need to maintain both the quantity and quality of freshwater resources in sectors such as mining.[487] The purpose is to ensure that there is always continuous access to fresh water amidst mining activities. Thus, current mining activities should be conducted in a way that does not pollute freshwater resources. In so doing, mining will not compromise the possibility for present and future generations to access freshwater equally and fairly.[488] The primary goal of the principle of equity is to ensure that our quality of life, which includes our ability to enjoy freshwater, is not exercised at the expense of others.[489]

Maintaining freshwater resources for the benefit of others requires the maintaining of a healthy environment and thus clean water.[490] The pursuit of equity, both intra-

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[479] RM Solow "Intergenerational equity and exhaustible resources" (1974) 41 *The Review of Economic Studies* 29 30; O Spijkers "Intergenerational equity and the sustainable development goals" (2018) 10 *Sustainability* 6-7.
[480] GF Maggio "Inter/intra-generational equity: current applications under international law for promoting the sustainable development of natural resources" (1996) 4 *Buff. Envtl. LJ* 161 184 & 187; Spijkers (2018) *Sustainability* 6-7.
[481] JM Hartwick "Intergenerational equity and the investing of rents from exhaustible resources" (1977) 67 *The American economic review* 972 972; Solow "Intergenerational equity and exhaustible resources" 34; Harding "Ecologically sustainable development:" 237.
[482] EB Weiss "Our Rights and Obligations to Future Generations for the Environment" (1990) 84 *American Journal of International Law* 198 199.
[483] Solow (1974) *The Review of Economic Studies* 30.
[484] 30.
[485] 32.
[486] Hartwick "Intergenerational equity and the investing of rents from exhaustible resources" 972.
[487] SJ Phansalkar "Water, equity and development" (2007) 3 *IJRM* 1 17.
[488] Adler et al. (2007) *The Economics of Peace and Security Journal* 33.
[489] Hueting (1990) *Ecological Economics* 111.
[490] Phansalkar (2007) *IJRM* 16-17.

generational and intergenerational, can help to promote environmental integrity discussed below.

3.2 Environmental Integrity

The principle of environmental integrity refers to the maintenance of natural processes that permanently sustain the continuous survival of human and other living things.[491] Environmental integrity, therefore, seeks to ensure the protection of the natural environment as a whole, as well as the maintenance of important environmental components or critical resources such as freshwater.[492]

By ensuring environmental integrity in a sector like mining, the health of natural systems, including water, is continuously ensured.[493] The essence of integrity in this context is to recognise that humankind forms an integral part of the natural environment, which must be protected.[494] Such protection could include the maintenance and enhancement of the quality of water resources by pursuing environmental integrity.[495]

Another way to understand the environmental integrity principle is to view it as an approach that seeks to promote the advantage of the interdependence of living organisms and nature.[496] Such interdependence suggests that human life only exists because there is nature to depend on and that an unsustainable environment is a serious hazard to all life.[497]

Reports that natural ecosystems are under huge pressure around the world from the ever-increasing demands placed on them by activities such as mining, raise concerns.[498] However, by including an environmental integrity approach in

[491] M Huettner "Risks and opportunities of REDD+ implementation for environmental integrity and socio-economic compatibility" (2012) 15 *Environmental Science & Policy* 4 6.
[492] RH Guerrette "Environmental integrity and corporate responsibility" (1986) 5 *Journal of Business Ethics* 409 409-410 & 412.
[493] M Brueckner, A Durey, R Mayes & C Pforr "The mining boom and Western Australia's changing landscape: Towards sustainability or business as usual?" (2013) 22 *Rural Society* 111 118.
[494] Guerrette (1986) *Journal of Business Ethics* 409.
[495] Brueckner et al. (2013) *Rural Society* 115.
[496] L Westra, P Miller, JR Karr, WE Rees & RE Ulanowicz "Ecological Integrity: Integrating Environment, Conservation, and Health" in D Pimentel, L Westra & RF Noss (eds) *Ecological Integrity: Integrating Environment, Conservation, and Health* (2013) 19 31.
[497] Kuhlman & Farrington (2010) *Sustainability* 3444.
[498] Z Guo, L Zhang & Y Li "Increased dependence of humans on ecosystem services and biodiversity" (2010) 5 *PLoS One* e13113 1.

environmental sustainability targets can help to curb the pressure.[499] Environmental integrity is likely when, instigators of such pressure, or authorities responsible for environmental protection, realise the importance of, and take action to, protect environmental aspects like water, which is constantly threatened by pollution.[500]

One way to ensure environmental integrity by avoiding water pollution in the mining sector is to take the precautionary principle into account when promoting water protection.[501] Reaching a sustainability target requires the adoption and implementation of a set of approaches, including precautionary or preventive measures as discussed hereafter.

3.3 Precautionary Principle

As highlighted in Chapter Two of this thesis,[502] activities like mining naturally pose several risks to the environment, including water pollution.[503] The element of risk in this instance suggests that there is a chance for water pollution to occur when mining operations take place.[504] Possible risks have to be mitigated to achieve water sustainability.[505] One way to mitigate water pollution is by following the precautionary principle.

The term precautionary principle means caution in advance, to prevent something risky from occurring.[506] Caution is the exercise of care in the context where there is uncertainty; thus, the possibility of a risk.[507] The precautionary principle is an

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[499] Westra et al. "Ecological Integrity: Integrating Environment, Conservation, and Health" in *Ecological Integrity: Integrating Environment, Conservation, and Health* 22.
[500] J O'Keeffe, P Lens, ER van Steveninck, W Douven, A van Dam & P van der Steen "The environmental integrity of freshwater resources" in G Alaerts & N. Dickinson (eds) *Water for a Changing World - Developing Local Knowledge and Capacity* (2008) 57 57 & 65.
[501] T O'Riordan & J Cameron *Interpreting the Precautionary Principle* (2013) 23.
[502] See section 3 of Chapter Two.
[503] I Razo, L Carrizales, J Castro, F Díaz-Barriga & M Monroy "Arsenic and heavy metal pollution of soil, water and sediments in a semi-arid climate mining area in Mexico" (2004) 152 *Water, Air, and Soil Pollution* 129 130.
[504] Razo et al. (2004) *Water, Air, and Soil Pollution* 147.
[505] S Dudka & DC Adriano "Environmental impacts of metal ore mining and processing: a review" (1997) 26 *Journal of Environmental Quality* 590 598.
[506] JF Whitehouse "Will the precautionary principle affect environmental decision-making and impact assessment?" in R Harding & EC Fisher (eds) *Perspectives on the Precautionary Principle* (1999) 59 69; IT Cousins, R Vestergren, Z Wang, M Scheringer and MS McLachlan "The precautionary principle and chemicals management: The example of perfluoroalkyl acids in groundwater" (2016) 94 *Environment International* 331 337.
[507] E Hey "The Precautionary Concept in Environmental Policy and Law: Institutionalizing Caution" (1992) 4 *Georgetown International Environmental Law Review* 303 309-310; Cousins et al (2016) *Environment International* 337.

expression of a need by administrative action,[508] for example, to consider risks and anticipate possible harm during decision making, and design necessary measures to counter such risks and harm.[509] In the context of environmental sustainability, the precautionary principle refers to the adoption of cost-effective measures to prevent harm to the environment,[510] even where there is a lack of comprehensive scientific certainty.[511]

The principle is criticised for being less pro-development as it does not encourage innovation in instances where the certainty of a risk-free innovation cannot be guaranteed.[512] Innovation may be required to prepare the well-being of future generations.[513] The principle is also criticised for being vague as it does not specify the degree of risk that can trigger caution and is merely speculative and not proof that possible future harm constitutes a real danger.[514] Despite these criticisms, it remains plausible to be proactive, rather than being reactive.[515]

In terms of water sustainability in the South African mining sector, the precautionary approach refers to the need to take necessary measures to avoid or limit possible risks as far as possible.[516] Such risks include the possibility of water pollution.[517] Containment measures should be taken even where there is a lack of full scientific

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[508] Administrative action is explained in Chapter Four of this thesis as an administrative decision or failure to take such decision by and administrator. See S 1 of the Promotion of Administrative Justice Act 3 of 2000 (PAJA).

[509] Hey (1992) 4 *Georgetown International Environmental Law Review* 310; A Diaconescu "The Insertion of the Precautionary Principle in the Environment Protection as a Legal Norm in the European Countries" (2017) 7 *Law Review* 85 89.

[510] R Costanza *Ecological Economics: The Science and Management of Sustainability* (1992) 154; Cousinset al (2016) *Environment International* 333.

[511] CF Cranor "Asymmetric information, the precautionary principle, and burdens of proof" in C Raffensperger, W Jackson, JA Tickner, J Tickner & S Steingraber (eds) *Protecting Public Health and the Environment: Implementing The Precautionary Principle* (1999) 74 76.

[512] P Sandin, M Peterson, SO Hansson, C Rudén & A Juthe "Five charges against the precautionary principle" (2002) 5 *Journal of Risk Research* 287 293; NM Sachs "Rescuing the Strong Precautionary Principle from Its Critics" (2011) 2011 *U. Ill. L. Rev.* 1285-1338.

[513] K Geiser "Cleaner production and the precautionary principle" in C Raffensperger, W Jackson, JA Tickner, J Tickner & S Steingraber (eds) *Protecting Public Health and the Environment: Implementing The Precautionary Principle* (1999) 323 330.

[514] RM M'Gonigle "The political economy of precaution" in C Raffensperger, W Jackson, JA Tickner, J Tickner & S Steingraber (eds) *Protecting Public Health and the Environment: Implementing The Precautionary Principle* (1999) 123 136; Sachs (2011) *U. Ill. L. Rev.* 1310.

[515] J Gertsakis & H Lewis *Sustainability and the Waste Management Hierarchy* (2003) A Discussion Paper on the Waste Management Hierarchy and its Relationship to Sustainability 7.

[516] Swart (2003) *SAIMM* 491.

[517] RP Schwarzenbach, T Egli, TB Hofstetter, U Von Gunten & B Wehrli "Global water pollution and human health" (2010) 35 *Annual Review of Environment and Resources* 109 112.

knowledge about a given situation or environmental hazard.[518] Remedial measures must be taken once it is likely that a given activity can negatively affect water resources.

Thus, action should be taken immediately by decision- and policy-makers where it is possible to anticipate that any activity could threaten or will have adverse consequences on freshwater resources.[519] Sustainable use of such resources is not achievable if caution regarding the prevention of water pollution, for example, is disregarded due to lack of scientific facts.[520] It is imprudent, and may even be considered irresponsible, for one to choose to rely only on scientific evidence to take action even where a threat of serious or irreversible environmental degradation is looming.[521] Proper precautionary behaviour requires careful consideration through environmental impact assessment[522] of all likely adverse environmental effects that may occur during the planning, policymaking and the practice phases.[523] Precautionary behaviour constitutes a conservation ethic in various environmental planning and management frameworks against issues such as water pollution.[524] In a mining setting, a precautionary approach is motivated by the need to ensure some balance between the extraction of mineral resources and its consequences.

Total predictability of future occurrences cannot be guaranteed.[525] Therefore, where water pollution occurs despite the application of the precautionary principle, achieving water sustainability would warrant the employment of measures to improve water quality.

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[518] Q Wang, D Kim, DD Dionysiou, GA Sorial & D Timberlake "Sources and remediation for mercury contamination in aquatic systems - a literature review" (2004) 131 *Environmental Pollution* 323 330.
[519] Schwarzenbach et al. (2010) *Annual Review of Environment and Resources* 113 & 127.
[520] AK Werner, S Vink, K Watt & P Jagals "Environmental health impacts of unconventional natural gas development: a review of the current strength of evidence" (2015) 505 *Science of the Total Environment* 1127 1131.
[521] KH Whiteside & R Gottlieb *Precautionary Politics: Principle and Practice in Confronting Environmental Risk* (2006) 145.
[522] As explained in Chapter Six.
[523] Whiteside & Gottlieb *Precautionary Politics:* 29-30.
[524] Cotter & Hannan *Our Community our Future:* 171; F Metz and K Ingold "Politics of the precautionary principle: Assessing actors' preferences in water protection policy" (2017) 50 *Policy Sciences* 721 725.
[525] J Segal "An industry perspective on the precautionary principle" in R Harding & EC Fisher (eds) *Perspectives on the Precautionary Principle* (1999) 80; Whiteside & Gottlieb *Precautionary Politics:* 146.

3.4 Principle of Improvement

Existing data indicate that the environment, and water in particular, is already in a state of decline.[526] Thus, measures that promote sustainable use must be in place to guarantee healthy water resources, which can be achieved through regular improvement of the natural environment.[527]

Improvement refers to a process through which action is taken with the intention to move something from one state to another, considered as the better or best alternative.[528] The process may be gradual or accelerated over a period, but mostly intended to render something suitable or produce an outcome that is suitable for human use, for example.[529] The process can include the adoption of measures on a regular basis to maintain the environment affected by human-made activities.[530]

An example of improvement within the South African mining sector would be where the government or mining companies take the necessary steps to treat or remove waste that is causing or is likely to cause water pollution.[531] Such treatment can be achieved, for example, by employing improved technology or better scientific understanding of sustainability as a concept.[532] Increased awareness of sustainability concerns among community members is another aspect that favours improvement towards reaching sustainability targets.[533]

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[526] JV Redfern, R Grant, H Biggs & WM Getz "Surface-water constraints on herbivore foraging in the Kruger National Park, South Africa" (2003) 84 *Ecology* 2092 2101; S Dos Santos, EA Adams, G Neville, Y Wada, A de Sherbinin, EM Bernhardt & SB Adamo "Urban growth and water access in sub-Saharan Africa: Progress, challenges, and emerging research directions" (2017) 607 *Science of the Total Environment* 497 498; J Alcamo, T Henrichs & T Rösch *World Water in 2025: Global Modeling and Scenario Analysis for the World Commission on Water for the 21st Century* (2017) 3 & 10.

[527] AC Olufemi, A Mji & MS Mukhola "Assessment of secondary school students' awareness, knowledge and attitudes to environmental pollution issues in the mining regions of South Africa: Implications for instruction and learning" (2016) 22 *Environmental Education Research* 43 44.

[528] RK Merton "Science, technology and society in seventeenth century England" (1938) 4 *Osiris* 360 446 & 506.

[529] P Slack *The Invention of Improvement: Information and Material Progress in Seventeenth-century England* (2015) 1.

[530] 62.

[531] I Demers, M Benzaazoua, M Mbonimpa, M Bouda, D Bois & M Gagnon "Valorisation of acid mine drainage treatment sludge as remediation component to control acid generation from mine wastes, part 1: Material characterization and laboratory kinetic testing" (2015) 76 *Minerals Engineering* 109 109-110.

[532] Demers et al. (2015) *Minerals Engineering* 109.

[533] Olufemi et al. (2016) 22 *Environmental Education Research* 43-45.

Continuous improvement is one factor that helps in achieving environmental sustainability. Significant change or success in an area cannot occur instantly.[534] Instead, realising continuous improvements through advances in the field of technology and scientific methods relating to sustainability is a key factor in ensuring continuous access to clean water.[535] An effective continuous improvement approach helps to maintain the environment in a good or better condition, thus ensuring equal access to water as discussed above.[536] Such improvement can also be achieved by ensuring integrating measures as discussed below.

3.5 Principle of Integration

The principle of integration refers to the inclusion of useful considerations in various processes (especially administrative) relating to the pursuit of societal wellbeing.[537] Integration exists when different things or opinions, at times conflicting, are successfully brought together to reach a common and satisfactory goal.[538] In the context of this thesis, integration means considering different ideas, techniques, and even views of people and communities to reach a common goal.[539] Such common goal includes the preservation of water resources through inclusive administrative processes.

Literature suggests that diverse considerations are more likely to be included in processes to maintain clean water at national and local levels when integrated approaches are adopted while dealing with environmental issues to achieve sustainability.[540] An integrated approach is also essential insofar as cooperation within government and between different levels of government, or governmental departments are concerned.[541] The importance stems from the fact that the separation

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[534] Slack *The Invention of Improvement:* 1.
[535] R Chhabra *Soil Salinity and Water Quality* (1996) 197.
[536] Phansalkar (2007) *IJRM* 16.
[537] MJ Epstein & AR Buhovac *Making Sustainability Work: Best Practices in Managing and Measuring Corporate Social, Environmental and Economic Impacts* 2nd ed (2017) 7.
[538] A Nollkaemper "Three conceptions of the integration principle in international environmental law" in A Lenschow (ed) *Environmental Policy Integration: Greening Sectoral Policies in Europe* (2012) 22 24.
[539] A Agarwal *Integrated Water Resources Management* (2000) 6.
[540] Cotter & Hannan *Our Community our Future:* 171; Agarwal *Integrated Water Resources Management* 6; MA Marino, SP Simonovic & IAHS International Commission on Water Resources Systems *Integrated Water Resources Management* (2001) 76-77; P Stålnacke & GD Gooch "Integrated water resources management" (2010) 24 *Irrigation and Drainage Systems* 156.
[541] O Bina "Strategic environmental assessment" in A Jordan & A Lenschow (eds) *Innovation in Environmental Policy?: Integrating the Environment for Sustainability* (2009) 134 147; WM Lafferty,

of functions is likely to result in a tendency of decisionmakers in one area to overlook water protection[542] because it is not in their purview. For instance, it is obvious that the Department of Mineral Resources (DMR) and the Department of Water and Sanitation (DWS) can play a significant role in protecting South Africa's water resources in the mining industry. As a result, it will be reasonable for one to believe that each of these departments can contribute to the success of the other through the sharing of information, for instance. Such a scenario can work better if officials of the DWS are consulted in the DMR's attempts to deal with water pollution, in particular.[543] Similarly, it can work where the DWS and the DMR work together to resolve issues that cut across both the departments and affect them differently.

Effective integration brings together various processes for the establishment of measures to preserve water resources. Such processes allow environmental impacts to be easily viewed and considered across levels of government or government departments before any decision making takes place.[544] Integration facilitates effective and close collaboration or cooperation for water preservation as a sustainability target in the South African mining sector. It could be a collaboration between staff members in a government department, or collaboration between levels of government.[545] It could even be a collaboration between local governments or between different levels of government and local communities as their involvement is also necessary.[546] The following section discusses how community involvement can improve environmental sustainability in the mining sector.

3.6 Principle of Community Involvement

Mining has, in the past, significantly contributed to economic growth in South Africa and still provides jobs to many who have only known the mining sector as their area

OM Larsen & A Ruud "Norway" in A Jordan & A Lenschow (eds) *Innovation in Environmental Policy?: Integrating the Environment for Sustainability* (2009) 202 215.

[542] WF Pedersen Jr "Decline of Separation of Functions in Regulatory Agencies" (1978) 64 *Va. L. Rev.* 991 1008.

[543] PMG "Department of Mineral Resources on its Strategic Plan, with specific reference to Programme 2: Mine Health & Safety, Programme 3: Mineral Regulation; Programme 6: Mineral Policy & Promotion (25-05-2015) NCOP Land Reform, Environment, Mineral Resources and Energy <https://pmg.org.za/committee-meeting/20944/> (accessed 21-06-19).

[544] J Nel, Y Xu, O Batelaan & L Brendonck "Benefit and implementation of groundwater protection zoning in South Africa" (2009) 23 *Water Resources Management* 2895 2906.

[545] Nel (2009) *Water Resources Management* 2906.

[546] Nel (2009) *Water Resources Management* 2899-2900.

of employment.[547] Nonetheless, there are indications that mining is a serious threat to communities' dependence on the environment.[548] Environmental dependence is the condition that shapes the relationship between humans and their environment, such that humans rely heavily on the environment for survival.[549] Reliance on the environment for survival means collecting water for consumption and industrial purposes.[550] Reliance on the environment also means consuming or using water-dependent organisms like fish and plants as many communities do.[551]

Communities in a rural setting or specifically those exposed to the impacts of mining depend on a well-sustained environment as their livelihoods are very much linked to the natural environment.[552] Accordingly, it is crucial that such communities form part of any attempt to achieve environmental sustainability.

Involvement refers to the act of actively taking part in the event of interest.[553] Taking active part in something implies that one voluntarily contributes either directly or indirectly towards the achievement of a shared vision or a thing of common interest.[554] Community involvement, therefore, refers to the act of communities taking part, either on invitation or own initiative, to achieve a societal goal such as environmental sustainability.[555] Invitation means communities are either consulted on an issue of

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[547] MISTRA *South Africa and the Global Hydrogen Economy: The Strategic Role of Platinum Group Metals* (2014) 255 & 293.
[548] S Stevens "Introduction" in S Stevens (ed) *Indigenous Peoples, National Parks, and Protected Areas: A New Paradigm Linking Conservation, Culture, and Rights* (2014) 3 12.
[549] A Angelsen, HO Larsen, JF Lund, C Smith-Hall & S Wunder "Why measure rural livelihoods and environmental dependence?" in A Angelsen, HO Larsen & CS Olsen (eds) *Measuring Livelihoods and Environmental Dependence: Methods for Research and Fieldwork* (2012) 1 1-2.
[550] M Falkenmark & J Rockstrom *Balancing Water for Humans and Nature: The New Approach in Ecohydrology* (2004) 66-67.
[551] C Revenga "Conditions and Trends of Freshwater Ecosystems and the Challenges to Meet Human Water Needs" in C King, J Ramkissoon, M Clüsener-Godt & Z Adeel (eds) *Water and Ecosystems: Managing Water in Diverse Ecosystems to Ensure Human Well-being* (2003) 1 4.
[552] MM Veiga, M Scoble & ML McAllister *Mining with Communities* (2001) unpublished paper presented at the Natural Resources Forum 191-192; B Zhengfu, HI Inyang, JL Daniels, O Frank & S Struthers "Environmental issues from coal mining and their solutions" (2010) 20 *Mining Science and Technology (China)* 215 222.
[553] S Selin & D Chevez "Developing a collaborative model for environmental planning and management" (1995) 19 *Environmental management* 189 190; B Gray "Conditions facilitating interorganizational collaboration" (1985) 38 *Human Relations* 911 912.
[554] Selin & Chevez "Developing a collaborative model" 190.
[555] JP Brosius, AL Tsing & C Zerner "Representing communities: Histories and politics of community-based natural resource management" (1998) 157 *Society and Natural Resources* 158; DC Miller and KS Nakamura "Protected areas and the sustainable governance of forest resources" (2018) 32 *Current Opinion in Environmental Sustainability* 96 100.

common interest or are encouraged to pursue own efforts, such as environmental conservation.[556] The latter can also occur by community's initiative.[557]

Community involvement in the context of this thesis entails a process of engaging community members through dialogue and collaboration relating to water protection issues affecting them or the society of which they are part.[558] Even if they are not directly involved in the decision-making process, it is necessary to understand how these communities are or would be affected by environmental issues.[559] In addition, it must be recognised that achieving clean water resources, or significant progress towards achieving this goal can be made easier once the experience of concerned communities is taken into account.[560] A community may perceive itself as owning the problems and the solutions when environmental problems such as water pollution presented by them are taken into consideration in decision-making processes from inception to implementation.[561] The resulting advantage is that communities feel involved and thus become active in providing inputs towards the achievement of safe water resources.[562]

In a mining area, communities are most exposed to the impacts of mining.[563] Consequently, communities are most likely to experience whatever adverse effects mining can have on the environment.[564] Water pollution is one of the most likely effects of mining on communities.[565]

The principle of involvement can also help in strengthening government programs such as waste minimisation, especially when community involvement makes it easier

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[556] J Cotruvo, GF Craun & N Hearne *Providing Safe Drinking Water in Small Systems: Technology, Operations, and Economics* (1999) 51; Miller et al (2018) *Current Opinion in Environmental Sustainability* 100.
[557] JN Mehta & SR Kellert "Local attitudes toward community-based conservation policy and programmes in Nepal: a case study in the Makalu-Barun Conservation Area" (1998) 25 *Environmental Conservation* 320 321.
[558] I Kapoor "Towards participatory environmental management?" (2001) 63 *Journal of Environmental Management* 269 271.
[559] Kapoor (2001) *Journal of Environmental Management* 274.
[560] Veiga et al. *Mining with Communities* 200.
[561] 198-199.
[562] Veiga et al. *Mining with Communities* 199; G Hilson "An overview of land use conflicts in mining communities" (2002) 19 *Land Use Policy* 65 66 & 78.
[563] See section 4 of Chapter Two of this thesis.
[564] Adler et al. (2007) *The Economics of Peace and Security Journal* 35.
[565] Hilson (2002) *Land Use Policy* 68.

to understand how communities are affected by mining waste.[566] Community involvement can facilitate the monitoring of environmental conditions in a given area when communities' first-hand experience with the environmental impacts of mining is taken into consideration.[567]

The demand for freshwater in South Africa is threatened by the serious challenges posed to ecosystem conservation by economic development, especially in the mining industry.[568] The principles discussed above highlight guidelines to achieve sustainability in the mining sector for instance. This thesis argues that the understanding of the sustainability concept in general and its principles, in particular, is vital to facilitate the understanding of what is required to achieve a safe environment.

The ability of authorities charged with the responsibility to promote and enforce environmental protection is equally important, as it is necessary for the attainment of environmental sustainability.[569] The reason is that such understanding can play a key role in achieving a sustainable environment in the South African mining sector.[570] It is even more likely when the above principles are given proper consideration to achieve the goals discussed below.

4 Using Legal Frameworks to Operationalise Sustainability Goals in Relation to Water in the Extractives Industry

Ecological goals can be used to identify where institutions have fallen short in realising their sustainability targets or goals, which are prerequisites for the measurement and realisation of progress in this field.[571] Sustainability can be achieved progressively

[566] JR Finnegan Jr & K Sexton "Community-based environmental decisions: Analyzing power and leadership" in K Sexton, AA Marcus, KW Easter & TD Burkhardt (eds) *Better Environmental Decisions: Strategies for Governments, Businesses, and Communities* (1999) 331 331 & 334-336; MD Ramirez-Andreotta, N Lothrop, ST Wilkinson, RA Root, JF Artiola, W Klimecki & M Loh "Analyzing patterns of community interest at a legacy mining waste site to assess and inform environmental health literacy efforts" (2016) 6 *J Environ Stud Sci.* 543 544.
[567] Cotter & Hannan *Our Community our Future:* 171.
[568] A Makela & M Meybeck "Designing a monitoring programme" in J Bartram & R Ballance (eds) *Water Quality Monitoring: A Practical Guide to the Design and Implementation of Freshwater Quality Studies and Monitoring Programmes* (1996) 35 57.
[569] Kapoor (2001) *Journal of Environmental Management* 270.
[570] S Pollard & D Du Toit "Integrated water resource management in complex systems: How the catchment management strategies seek to achieve sustainability and equity in water resources in South Africa" (2008) 34 *Water SA* 671 674 & 676.
[571] BF Noble "Institutional criteria for co-management" (2000) 24 *Marine Policy* 69 73.

over time and within a specific geographical area,[572] especially when properly enforced.[573]

This thesis focuses specifically on environmental goals that form part of sustainability goals. The focus is narrowed further to goals specifically related to water sustainability as they form part of the objective of this thesis. With specific regard to water sustainability goals, it is necessary to highlight that there are many, including water sanitation and management. For the purposes of this thesis, only those that relate directly to water conservation in the mining sector are discussed. The goals are grouped into main categories (access to water, water quality, human safety and environmental safety) as per targeted outcomes by legal frameworks. The discussion in this section, therefore, highlights why sustainability for the wellbeing of communities can be achieved through legal promotion of access to clean water resources that are safe for both the environment and human.

4.1 Promotion of Access to Water

The total quantity of water available or allocated for use by humans and ecosystems is key in determining the extent to which access to water is maintained.[574] The key role played by legislation in this regard is to ensure that water resources are used sustainably.[575] Therefore, officials entrusted with the protection of water resources should ensure, to the best of their abilities, that the extent of the impacts of activities such as mining on available clean water is minimised.[576] The purpose is to ensure that access to water is not affected by activities whose impacts can be minimised. The amount of water can include precipitation, underground water or surface water.[577] Thus, realising water sustainability in the mining sector means that while implementing

[572] F Astleithner, A Hamedinger, N Holman & Y Rydin "Institutions and indicators–The discourse about indicators in the context of sustainability" (2004) 19 *Journal of Housing and the Built Environment* 7 9.
[573] LJ Kotzé "The judiciary, the environmental right and the quest for sustainability in South Africa: A critical reflection" (2007) 16 *RECIEL* 298 301.
[574] IT Winkler *The Human Right to Water: Significance, Legal Status and Implications for Water Allocation* (2014) 1.
[575] AY Hoekstra, MM Mekonnen, AK Chapagain, RE Mathews & BD Richter "Global monthly water scarcity: blue water footprints versus blue water availability" (2012) 7 *PLoS One* e32688 2.
[576] Adler et al. (2007) *The Economics of Peace and Security Journal* 33 & 36.
[577] IA Shiklomanov "Appraisal and assessment of world water resources" (2000) 25 *Water International* 11 11 & 29.

or enforcing applicable laws, authorities entrusted with water protection must ensure that the effects of mining are minimised to protect water available for use.[578]

Ensuring available water in the natural environment is another goal that sustainability seeks to achieve.[579] This goal is promoted through the legal framework by determining and ensuring that there is sufficient water left in the natural environment following water usage by humans and ecosystems.[580] The sustainability goal with regard to ensuring water availability serves to indicate how much water is left after usage.[581] Specifically, it is a goal that can be promoted through a legal framework to ensure that water is currently used in ways that will not hamper access in future.[582] The goal helps to ensure that present needs for water are met while creating the possibility for the needs of future generations to be taken care of by offering proper protection to ecosystems.[583]

To ensure that there is continuous access to water resources, sustainability, as promoted through the legal framework, should seek to ensure that the effect of mining in South Africa, including water pollution is minimised considerably.[584] Having continuous access to available water resources and eventually using them productively depends on the quality of such water resources as discussed below.

4.2 Achievement of Clean Water Resources

Water sustainability, as pursued in the mining sector seeks to ensure that access to water is constant.[585] Though availability of freshwater resources is essential, accessing potable water is most important and thus a target that effective implementation of legislation should seek to achieve. For people and ecosystems to

[578] Ashton et al. *An overview of the impact of mining and Mineral Processing Operations on water resources and water quality* lxii.
[579] PJ Ashton "Avoiding conflicts over Africa's water resources" (2002) 31 *AMBIO: A Journal of the Human Environment* 236 236.
[580] Hoekstra et al. (2012) *PLoS One* 1.
[581] V Smakhtin, C Revenga, P Döll, R Tharme, J Nackoney & Y Kura *Taking Into Account Environmental Water Requirements in Global-scale Water Resources Assessments* (2004) 21; Hoekstra et al. (2012) *PLoS One* 1.
[582] R Alexander & G Poyyamoli "Activity-based water resources and climate change education" in W Leal Filho (ed) *Climate Change and the Sustainable Use of Water Resources* (2011) 557 559.
[583] P Johnston, M Everard, D Santillo & KH Robèrt "Reclaiming the definition of sustainability" (2007) 14 *ESPRI* 60 64.
[584] Alexander & Poyyamoli "Activity-based water resources and climate change" in *Climate Change and the Sustainable Use of Water* 559.
[585] Ashton (2002) *AMBIO: A Journal of the Human Environment* 236.

enjoy the benefits that accompany safe water resources, such water must be of good quality to have a positive impact.[586] Thus, it is critical for authorities charged with the responsibility to protect water sustainability, to assess and promote water quality constantly, especially with regard to its usefulness to human and ecosystems in general.[587] To promote clean water resources on a regular basis, there must be provisions within the legal framework to promote the measuring of water quality by competent officials, to ensure that water used for a specific purpose is of suitable quality for that purpose.[588] Reference is being made here to water for human consumption, recreational, manufacturing and farming purposes.[589]

In a mining environment, the pursuit of this goal helps to drive constant attempts to determine where and when water resources are polluted; thus, determining when a water source is not suitable for human use.[590] Provisions pursuing continuous access to safe water in the environment helps to ensure that a particular water source on which flora, fauna and related ecosystems depend to grow, is suitable.[591] Like humans, non-potable water can be threatening to other living organisms.[592] Low or poor-quality water is likely to have adverse effects, like poor health. Examples of poor health include poisoning either after drinking contaminated water or after consuming plants and animals that have accumulated heavy metals or chemicals such as mercury from polluted water.[593] It has been found that a heavy metal like cadmium has the potential to hamper water quality as it can cause renal dysfunction after “long-term exposure”.[594]

Access to safe water resources in the South African mining sector to an extent depends on the legal framework that is properly implemented and enforced.[595] The legal framework is more effective in pursuing environmental sustainability if it

[586] Shiklomanov (2000) *Water International* 11.
[587] Alexander & Poyyamoli "Activity-based water resources and climate change" in *Climate Change and the Sustainable Use of Water* 560
[588] D Kemp, CJ Bond, DM Franks & C Cote "Mining, water and human rights: making the connection" (2010) 18 *Journal of Cleaner Production* 1553 1555.
[589] Kemp et al. (2010) *Journal of Cleaner Production* 1554 & 1559.
[590] 1556.
[591] JO Duruibe, MOC Ogwuegbu & JN Egwurugwu "Heavy metal pollution and human biotoxic effects" (2007) 2 *IJPS* 112 112.
[592] Dudka & Adriano (1997) *Journal of Environmental Quality* 590; Duruibe et al. (2007) *IJPS* 114.
[593] Duruibe et al. (2007) *IJPS* 116.
[594] 116.
[595] Nel et al. (2009) *Water Resources Management* 2905.

promotes the protection and treatment of water resources suitable for human health as a sustainability goal.[596] Thus, safe water resources and their effect on human health discussed below is one goal that sustainability must pursue.

4.3 Protection of Human Safety Against Environmental Issues

One goal of sustainability that must be promoted through legislation is to ensure that water and water-dependent resources are safe for humans.[597] Human safety is affected directly when contaminated water is consumed.[598] Human safety is also adversely affected indirectly when water-dependent resources are consumed. Resources like fish in mining areas are in many ways affected by environmental conditions such as water pollution caused at times by human activities, including mining.[599] Effects on water-dependent resources suggest that human health is likely to be indirectly affected by an environmental condition such as water pollution.[600] Thus, there is a need for provisions to guide authorities charged with the monitoring and implementation of policies to mitigate health issues likely to affect humans directly or indirectly, following the use of water and related resources respectively.[601]

Goals under this category can be achieved by measuring the quality of water used by people and how and where the water is used.[602] In a mining environment, this process will help to determine the degree to which vulnerable communities are exposed to water that represents a potential risk to their health.[603] The process can also help to assess how effective the existing legal framework is.[604] Seeking to ensure human health is more relevant in situations where it had previously been established that water sources were contaminated.[605]

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[596] Kemp et al. (2010) *Journal of Cleaner Production* 1554 & 1559.
[597] S Martin & W Griswold "Human health effects of heavy metals" (2009) 15 *Environmental Science and Technology Briefs for Citizens* 1 2.
[598] Martin & Griswold (2009) *Environmental Science and Technology Briefs for Citizens* 1-2.
[599] JH Mol & PE Ouboter "Downstream Effects of Erosion from Small-Scale Gold Mining on the Instream Habitat and Fish Community of a Small Neotropical Rainforest Stream" (2004) 18 *Conservation Biology* 201 202-203.
[600] Mol & Ouboter (2004) *Conservation Biology* 212.
[601] G Hilson "Sustainable development policies in Canada's mining sector: an overview of government and industry efforts" (2000) 3 *Environmental Science & Policy* 201 207-208.
[602] Mol & Ouboter (2004) *Conservation Biology* 204.
[603] Hilson (2000) *Environmental Science & Policy* 203.
[604] GC Daily "Management objectives for the protection of ecosystem services" (2000) 3 *Environmental Science & Policy* 333 337.
[605] Daily (2000) *Environmental Science & Policy* 204.

In the South African mining sector, knowing how people use water within the natural environment is essential in finding ways to enforce sustainability principles. Such understanding helps to identify the types of activities for which water is used, especially when such use is related to the natural environment.[606] One such activity is when water is used for the assimilation of mine waste.[607] Knowing the impacts that these activities have on water sources as well as the effects that these impacts can have on human health helps in the pursuit of environmental sustainability.[608]

The understanding of how water-dependent resources are used is a goal that cannot be neglected even though it may only indicate the indirect impact of water pollution on health. In this regard, sustainability mainly seeks to ensure the safety of resources such as freshwater fish consumed by humans.[609] The need to pursue this goal lies in the fact that it ensures that the risk for humans to consume contaminated resources harvested from water resources is either avoided or mitigated through law enforcement.[610] Fish obtained from poisoned waters may represent a potential hazard for human health.[611] Just like water-dependent resources can be contaminated by polluted water, the following section discusses how the state of the environment can equally be affected if the quality of water is reduced.

4.4 Maintenance of a Safe Environment

Nature presents humankind with what has been termed "natural capital"[612] or what others have called "environmental services"[613] or "ecosystem services."[614] "Natural

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[606] SR Perret *Water Policies and Smallholding Irrigation Schemes in South Africa: A History and New Institutional Challenges* (2002) *Working Paper* 12.
[607] B Lottermoser *Mine Wastes: Characterization, Treatment and Environmental Impacts* 2nd ed (2007) 108.
[608] 18 & 20.
[609] N Belzile, YW Chen, JM Gunn, J Tong, Y Alarie, T Delonchamp & CY Lang "The effect of selenium on mercury assimilation by freshwater organisms" (2006) 63 *Canadian Journal of Fisheries and Aquatic Sciences* 1 4.
[610] Belzile et al. (2006) *Canadian Journal of Fisheries and Aquatic Sciences*2.
[611] T Hastein, B Hjeltnes, A Lillehaug, J Utne Skare, M Berntssen & AK Lundebye "Food safety hazards that occur during the production stage: challenges for fish farming and the fishing industry" (2006) 25 *Rev Sci Tech* 607 608 & 613.
[612] Costanza & Daly (1992) *Conservation Biology* 38; EF Schumacher *Small is Beautiful: A Study of Economics as if People Mattered* (1973) 4.
[613] CL Wilson & WH Matthews *Man's Impact on the Global Environment, Report of the Study of Critical Environmental Problems* (1970) 123-126; Mancini, MS, A Galli, V Niccolucci, D Lin, L Hanscom, M Wackernagel, S Bastianoni & N Marchettini "Stocks and flows of natural capital: Implications for Ecological Footprint" (2017) 77 *Ecological Indicators* 123 124.
[614] PR Ehrlich & HA Mooney "Extinction, substitution, and ecosystem services" (1983) 33 *BioScience* 248 248-249; Mancini et al (2017) *Ecological Indicators* 123.

capital" refers to the world's total natural assets such as the soil, air, water and living things.[615] Humans derive a considerable amount of services or benefits from "natural capital". Services that render human life possible on earth are usually qualified as "ecosystem services".[616] An example of such services is the use of various natural resources by humanity for multiple purposes, such as domestic and industrial usage.[617] The usage is very likely to hamper the safety of the condition of the ecosystem like water sources.[618] Environmental safety refers to the state of an environment that is not polluted.[619] Environmental safety as a sustainability goal is achievable to some extent, and effective implementation of environmental protection legislation can help achieve that goal.[620]

The sustainability goal to achieve a safer environmental involves the ability of the legal framework to provide for a natural environment in which threats to people's safety are minimised.[621] The goal is to ensure that water sources for example that form part of the natural environment are well protected.[622] The biological condition of water sources can be maintained or improved by maintaining environmental conditions in various ways depending on the expected outcome.[623] In the mining sector, environmental safety goals can include ensuring that water resources are regularly monitored to identify where water quality requires immediate attention.[624] The purpose of the monitoring is to ensure that potable water is continuously available for human consumption and other living organisms.[625] Thus, measures intended to ensure the

[615] Schumacher *Small is Beautiful:* 4.
[616] Ehrlich & Mooney (1983) *BioScience* 248.
[617] M van Noordwijk, B Leimona, R Jindal, GB Villamor, M Vardhan, S Namirembe, D Catacutan, J Kerr, PA Minang & TP Tomich "Payments for environmental services: evolution toward efficient and fair incentives for multifunctional landscapes" (2012) 37 *Annual Review of Environment and Resources* 389 391.
[618] CO Orubu & DG Omotor. "Environmental quality and economic growth: Searching for environmental Kuznets curves for air and water pollutants in Africa" (2011) 39 *Energy Policy* 4178 4179.
[619] O Käppeli & L Auberson "The science and intricacy of environmental safety evaluations" (1997) 15 *Trends in Biotechnology* 342 343.
[620] Kotzé (2007) *RECIEL* 309.
[621] Shiklomanov (2000) *Water International* 11.
[622] Lottermoser *Mine Wastes:*135; N Funke, K Nortje, K Findlater, M Burns, A Turton, A Weaver & H Hattingh "Redressing inequality: South Africa's new water policy" (2007) 49 *ESPSD* 10 16.
[623] M Brown, B Barley & H Wood *Minewater Treatment* (2002) 38.
[624] G Hilson & V Nayee. "Environmental management system implementation in the mining industry: a key to achieving cleaner production" (2002) 64 *International Journal of Mineral Processing* 19 20 & 22.
[625] Brown et al. *Minewater Treatment* 15 & 16.

maintenance of a healthy environment are critical, as it means ensuring continuous access to safe water resources as discussed above.[626]

The preservation of environmental health in the South African mining sector involves providing for the measuring of the quantity and quality of water resources and water-dependent ecosystems.[627] The primary objective in doing so is to determine the extent to which ecosystems are productive.[628] Freshwater ecosystems are home to various forms of living organisms often qualified as part of the food chain.[629] Thus, determining how safe the ecosystem could be is important as living organisms within the freshwater food chain depend on such safety.[630]

The above discussion shows that the pursuit of environmental sustainability goals can help in preserving water resources in a sector such as mining, which causes water pollution.[631] The above goals may also be critical in implementing the legal framework, especially when linked to water sustainability goals. Such water sustainability goals are determined points at which the state or condition of the environment require attention to ensure that a condition such as water pollution does not get worse or disastrous.[632]

It may be complex to select a specific set of sustainability goals to be achieved in a particular area. However, the solution lies in selecting a set of core targets that are achievable in a specific context. Achieving water sustainability in the South African mining sector requires authorities, amongst others, to seek, through effective decision-making processes, to reach identified and achievable sustainability goals such as those discussed above. It is even more critical that the pursued goals align with those provided within the legal frameworks related to water protection.[633]

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[626] Funke et al. (2007) *ESPSD* 16; Brown et al. *Minewater Treatment* 15-16.
[627] TM Askham & HM Van der Poll "Water sustainability of selected mining companies in South Africa" (2017) 9 *Sustainability* 1 9.
[628] ZW Kundzewicz "Water resources for sustainable development" (1997) 42 *Hydrological Sciences Journal* 467 468.
[629] L Persson, S Diehl, L Johansson, G Andersson & SF Hamrin "Trophic interactions in temperate lake ecosystems: a test of food chain theory" (1992) 140 *The American Naturalist* 59 61.
[630] PJ Oberholster, JG Myburgh, PJ Ashton, JJ Coetzee & AM Botha "Bioaccumulation of aluminium and iron in the food chain of Lake Loskop, South Africa" (2012) 75 *Ecotoxicology and Environmental Safety* 134 135.
[631] Hueting (1990) *Ecological Economics* 111.
[632] T Gleeson, J VanderSteen, MA Sophocleous, M Taniguchi, WM Alley, DM Allen & Y Zhou "Groundwater sustainability strategies" (2010) 3 *Nature Geoscience* 378 378.
[633] See Chapter Six of this thesis.

5 Conclusion

The premise of the discussion in this chapter has been to explain the theory of sustainability as an essential concept in the pursuit of safe water in the South African mining sector.[634] Following the definition of the concept, this chapter arrives at the conclusion that sustainability as a concept is broad as it has received various interpretations.[635] The concept is also interdisciplinary as it applies in various disciplines and thought of differently.[636] However, the concept is criticised for discouraging development.[637] Despite conflicting perception or facts regarding sustainability, this chapter posits that water can still be preserved through sustainable practices.

From the discussions in this chapter, sustainability applied to environmental protection means the use of resources like water, without ignoring the needs of fellow members of society as well as of the needs of generations yet to be born.[638] Thus, mining activities should be conducted in ways that the occurrence of water pollution is constantly minimised to achieve water sustainability in the South African mining sector.[639]

Successful realisation of environmental sustainability, as established in this chapter, requires observing a series of important principles. These principles include ensuring that the environment is well preserved to afford equal access to water amongst and between generations.[640] The principle of precaution is also required to ensure that the quantity and quality of water resources are well preserved and improved.[641] The principle of integration ensures that various valuable opinions and contribution are taken into account when taking actions to protect water resources.[642] It is important to

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[634] RQ Grafton, J Pittock, R Davis, J Williams, G Fu, M Warburton, B Udall, R McKenzie, X Yu & N Che "Global insights into water resources, climate change and governance" (2013) 3 *Nature Climate Change* 315 320.
[635] See section 2 of this chapter. See also M Schröter, KH Stumpf, J Loos, APE van Oudenhoven, A Böhnke-Henrichs & DJ Abson "Refocusing ecosystem services towards sustainability" (2017) 25 *Ecosystem services* 35 36.
[636] See section 2.1.2 of this chapter. See also J Pezzey "Sustainability: An interdisciplinary guide" (1992) 1 *Ecosystem services* 321 322.
[637] See section 3.3 of this chapter.
[638] Johnston et al. (2007) 14 *ESPRI* 64.
[639] BJ Glaister & GM Mudd "The environmental costs of platinum–PGM mining and sustainability: Is the glass half-full or half-empty?" (2010) 23 *Minerals Engineering* 438 441.
[640] Adler et al. (2007) *The Economics of Peace and Security Journal* 33.
[641] See section 3.3 of this chapter.
[642] Agarwal *Integrated Water Resources Management* 6.

involve communities in such integration efforts, especially those exposed to the adverse effects of mining who have first-hand experience with issues such as water pollution.[643]

It also emerges from this chapter that sustainability is achievable when the legal framework is used to operationalise sustainability goals while pursuing water protection in the mining sector. It is therefore vital that the South Africa legal framework contains provisions that promote continuous access to clean water resources amidst mining.[644] Also, the legal framework can promote environmental sustainability to ensure human and environmental safety.[645]

The quest to preserve water for wellbeing affirms the fact that humans depend on the natural environment for survival. This thesis discusses the governance theory on environment in the next chapter as a concept that can enable the attainment of water sustainability through decision making and ensure continuous human dependence thereon.

[643] Brosius et al. (1998) *Society and Natural Resources* 158.
[644] Alexander & Poyyamoli "Activity-based water resources and climate change" in *Climate Change and the Sustainable Use of Water* 559.
[645] See section 4.3 of this chapter.

CHAPTER FOUR: UNDERSTANDING THE CONCEPT: ENVIRONMENTAL GOVERNANCE

1 Introduction

The fact that water pollution remains problematic suggests that prior prevention methods have not been effective enough.[646] Environmental governance is one means through which water sustainability can be ensured,[647] thus translating into a healthier environment for communities and mitigation of existing water concerns.[648]

The preceding chapter discusses the concept of environmental sustainability with regard to mining and its implications for South Africa, in general, and affected communities, in particular.[649] Environmental sustainability depends, to some extent, on effective governance to adopt and implement measures that consider the needs of present and future generations.[650] Such measures seek to preserve common resources, such as water.[651] An effective decision-making process is needed to successfully promote proper planning and enforcement of existing laws.[652] These elements are elaborated on below, to consider how theories on governance and water sustainability can promote the preservation of safe water resources.

The mandate to ensure a sustainable environment can be realised through governance practices.[653] The following discussion focuses on unpacking the concept of governance and how it relates to environmental sustainability as discussed in Chapter Three. It is argued that governance at a state level is critical in designing, promoting or enforcing measures that ensure a healthier environment.[654] The crucial role of governance is illustrated in this thesis by a discussion of the reduction in the quantity and quality of our planet's fresh water supply.[655] In this way, this thesis

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[646] KK Kefeni, TAM Msagati & BB Mamba "Acid mine drainage: prevention, treatment options, and resource recovery: a review" (2017) 151 *Journal of Cleaner Production* 475 482.
[647] MC Lemos & A Agrawal "Environmental governance" (2006) 31 *Annu. Rev. Environ. Resour.* 297 298.
[648] Lemos & Agrawal (2006) *Annu. Rev. Environ. Resour.* 314 & 317-318.
[649] See section 3 of Chapter Three.
[650] Goodland & Daly (1996) *Ecological Applications* 1003.
[651] E Ostrom *Governing the Commons: The Evolution of Institutions for Collective Action* (1990) 97.
[652] S 1 of NEMA.
[653] JG Nel & LJ Kotzé "Environmental management: An introduction" in HA Strydom & ND King (eds) *Environmental Management in South Africa* (2009) 1 30.
[654] P Lund-Thomsen "Corporate accountability in South Africa: the role of community mobilizing in environmental governance" (2005) 81 *International Affairs* 619 625.
[655] A Pal, Y He, M Jekel, M Reinhard & KYH Gin "Emerging contaminants of public health significance as water quality indicator compounds in the urban water cycle" (2014) 71 *Environment international* 46

comments on the importance of governance for water sustainability in the mining context. The next section provides an overview of the concept of "governance" as it is relevant in the context of this thesis.

2 What is Governance?

The term "governance" is broadly used, in many different contexts, and as such, the interpretation of the concept varies depending on the area where it applies.[656] The fact that governance as a concept applies to various contexts makes it difficult to provide a general understanding of the concept.[657] However, as a point of departure, "governance" can be defined as the means by which authorities seek to achieve predetermined targets through outcomes and decision-making processes,[658] as explained below.

Put plainly, governance is about processes to reach specific goals.[659] At the governmental level, governance is the making of policy and execution of executive mandates through managerial, political and legal processes.[660] In contexts like nongovernmental organisations and institutions, governance refers to ways by which positive outcomes can be influenced and achieved.[661] The exercise of such authority involves the establishment of administrative processes, and the continuous monitoring of their implementation at the institutional or organisational level.[662]

It is the complexity and interdisciplinary nature of governance that make it an overarching concept.[663] The complexity is also caused by multiple interpretations

55; S Atapattu & CG Gonzalez "The North-South divide in international environmental law: Framing the issues" in S Alam, S Atapattu, CG Gonzalez & J Razzaque (eds) *International Environmental Law and the Global South* (2015) 1 1.

[656] RAW Rhodes "The new governance: governing without government" (1996) 44 *Political studies* 652 653-655; G Stoker "Public-private partnerships and urban governance" in J Pierre (ed) *Partnerships in Urban Governance: European and American Experiences* (1998) 34 35-36.

[657] G Stoker "Governance as theory: five propositions" (1998) 50 *International social science journal* 17 17.

[658] D Kaufmann *Myths and Realities of Governance and Corruption* (2005) IDEAS Working Paper Series from RePEc 82.

[659] M Bevir *Governance: A Very Short Introduction* (2012) 3.

[660] World Bank "What is governance?" (2019) Worldwide Governance Indicators <http://info.worldbank.org/governance/wgi/index.aspx#home> (accessed 26-08-2019).

[661] J Cohen, G Krishnamoorthy & AM Wright "Corporate governance and the audit process" (2002) 19 *Contemporary accounting research* 573 577-578.

[662] LA Feris "The role of good environmental governance in the sustainable development of South Africa" (2010) 13 *PELJ* 73 74; G Hydén, J Court & K Mease *Making Sense of Governance: Empirical Evidence from Sixteen Developing Countries* (2004) 2.

[663] Bevir *Governance:* 3.

attributed to the concept of governance.[664] The concept is understood differently at different levels, which could be the state, corporate, NGO, or a community.[665] The complexity is also caused by the various forms of governance attributed to the concept.[666] Administrative governance as a function of public administration seeks to promote effective discharge of government functions.[667]

Governance is, therefore, complex[668] and applies across disciplines for different targets.[669] The concept of governance is thus multifaceted. Definitions of governance vary significantly, and this implies that understanding it depends on the context within which one is working. Besides political science as indicated above, governance applies to various disciplines, including environmental management.

According to the World Bank, governance refers to mechanisms and institutions through which authority is put into practice.[670] The exercise of such authority is based on the process by which governments can be established, monitored and dissolved.[671] The World Bank's interpretation suggests that governance is mainly about the process through which government institutions are established.[672] The definition proposed by the World Bank is designed to achieve its aims, including good leadership and economic reform through government reforms in developing countries.[673]

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[664] PC Zumbansen "The Conundrum of Order: The Concept of Governance from an Interdisciplinary Perspective" (2010) 6 *Comparative Research in Law & Political Economy* 1 3.
[665] J Graham, B Amos & T Plumptre *Principles for good governance in the 21st Century* (2003) Policy brief 1.
[666] A Shleifer & RW Vishny "A survey of corporate governance" (1997) 52 *The journal of finance* 737 738; G Hydén, J Court, and K Mease *Making Sense of Governance: Empirical Evidence from Sixteen Developing Countries* (2004) 2.
[667] SP Osborne *The New Public Governance: Emerging Perspectives on the Theory and Practice of Public Governance* (2010) 7.
[668] M Bevir "Governance as theory, practice and dilemma" in M Bevir (ed) *The SAGE Handbook of Governance* (2011) 1 4; B Jessop "The governance of complexity and the complexity of governance: preliminary remarks on some problems and limits of economic guidance" (1997) *Beyond Market and Hierarchy: Interactive Governance and Social Complexity* 95 96.
[669] C Ansell & J Torfing "Introduction: Theories of governance" in C Ansell & J Torfing (eds) *Handbook on Theories of Governance* (2016) 1 1-2.
[670] World Bank "What is governance?".
[671] World Bank "What is governance?".
[672] S Guhan "World Bank on governance: a critique" (1998) 33 *Economic and Political Weekly* 185 185.
[673] C Santiso "Good governance and aid effectiveness: The World Bank and conditionality" (2001) 7 *The Georgetown Public Policy Review* 1 3; G Harrison *The World Bank and Africa: The Construction of Governance States* (2004) 7.

The modern understanding of the concept suggests that governance goes beyond the making and unmaking of government.[674] Governance can be associated with processes to effect changes likely to ensure respect for and promotion of citizens' well-being.[675] Governance can also serve as a tool to promote and achieve conflict resolution.[676]

Governance is not necessarily limited to the actions of governments,[677] as in the instance of political science.[678] Government and governance differ in various ways.[679] In the context of a state, for instance, "government" is the organisation of the state while "governance" characterises how government performs.[680] The government can be defined as the formal or institutional arrangement that exists at the nation-state level.[681] An institutional arrangement is understood as establishments and organisations set up for purposes of rendering public services to citizens.[682] These services include the protection and provision of clean water resources.[683] Government can achieve clean water through processes by which requirements such as schemes, rules, norms, and routines are transformed into official guidelines for acceptable behaviour.[684] Such processes seek to ensure public order and collective action, mainly through decision-making processes.[685]

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[674] OM Brandes "Practicing ecological governance: The case of the soft path for water" in DB Brooks, OM Brandes & S Gurman (eds) *Making the Most of the Water We Have: The Soft Path Approach to Water Management* (2009) 61 64.
[675] D Armitage, C Béné, AT Charles, D Johnson & EH Allison "The interplay of well-being and resilience in applying a social-ecological perspective" (2012) 17 *Ecology and Society* <https://www.ecologyandsociety.org/vol17/iss4/art15/> (accessed 14-11-2019).
[676] Sida "Good Governance" (2002) 2-3 <http://www.sida.se/contentassets/ccbc7b4269674651a629f06abd9e2bcd/good-governance_762.pdf> (accessed 25-08-16).
[677] G Hyden, J Court & K Mease *Making Sense of Governance: The Need for Involving Local Stakeholders* (2003) 7; Sowman & Wynberg "Governance, equity and sustainability in sub-Saharan Africa: An introduction to the discourse" in *Governance for Justice and Environmental Sustainability: Lessons Across Natural Resource Sectors in Sub-Saharan Africa* 1 6.
[678] F Fukuyama *State Building: Governance and World Order in the 21st Century* (2017) 10-11; RAW Rhodes *Understanding Governance: Policy Networks, Governance, Reflexivity, and Accountability* (1997) 4-5 & 12.
[679] G Stoker "Governance as theory: Five propositions" (1998) 50 *ISSJ* 17 19.
[680] V Chhotray & G Stoker *Governance Theory and Practice: A Cross-Disciplinary Approach* (2008) 17.
[681] Osborne *The New Public Governance:* 66.
[682] J Mahoney & K Thelen "A theory of gradual institutional change" in J Mahoney & K Thelen (eds) *Explaining Institutional Change: Ambiguity, Agency, and Power* (2010) 1 2.
[683] TG Falleti "The evolution of health care reforms in Brazil, 1964-1988" in J Mahoney & K Thelen (eds) *Explaining Institutional Change: Ambiguity, Agency, and Power* (2010) 38 47.
[684] AZ Kondra & DC Hurst "Institutional processes of organizational culture" (2009) 15 *Culture and Organization* 39 40.
[685] Stoker (1998) *ISSJ* 17.

Government discharges its mandate in the interest of the population.[686] Thus, its dealings involve collaboration with key stakeholders,[687] especially regarding issues of national interest like the protection of water resources.[688] Moreover, its actions are likely to have consequences for the people concerned.[689] What is needed is transparent dealings, consideration of other stakeholders' views by creating room for participation and being accountable.[690]

The following section highlights how governance should be understood in the context of water protection.

3 Governance of the Environment

Governance applied to environmental sustainability is known as environmental governance. If broadly, governance is defined as the achievement of targets through processes,[691] in a contextualised sense, environmental governance is the achievement of environmental sustainability targets through governance processes.[692]

The general concept of governance was translated into the context of environmental sustainability through political ecology[693] and environmental policies.[694] Political ecology has the potential to contribute to environmental governance by informing policymakers and organisations of processes in the pursuit of environmental sustainability.[695] Policymaking regarding environmental concerns seeks

[686] RZ Lawrence "Is it really the economy, stupid?" in JS Nye, P Zelikow & DC King (eds) *Why People Don't Trust Government* (1997) 111 130.
[687] Chhotray & Stoker *Governance Theory and Practice:* 3.
[688] TL Cumming, RT Shackleton, J Förster, J Dini, A Khan, M Gumula & I Kubiszewski "Achieving the national development agenda and the Sustainable Development Goals (SDGs) through investment in ecological infrastructure: A case study of South Africa" (2017) 27 *Ecosystem Services* 253 254.
[689] R Hall & T Kepe "Elite capture and state neglect: new evidence on South Africa's land reform" (2017) 44 *Review of African Political Economy* 122 128.
[690] Cumming et al. (2017) *Ecosystem Services* 254-255.
[691] See section 2 of this chapter.
[692] Feris (2010) PELJ 74.
[693] Political ecology studies how environmental concerns are impacted by political, economic and social factors. See F Thone "Nature ramblings: we fight for grass" (1935) 27 *The Science News-Letter* 14 14; P Robbins *Political Ecology: A Critical Introduction* 2nd ed (2012) 14.
[694] S Cohen *Understanding Environmental Policy* 2nd ed (2014) 179.
[695] RL Bryant "Power, knowledge and political ecology in the third world: a review" (1998) 22 *Progress in physical geography* 79 79-80.

organisational or institutional measures to ensure environmental regulation, as well as implementation and enforcement of such regulation.[696]

The ideology underpinning the concept of environmental governance is the promotion of environmental sustainability as a means to ensure better management of natural resources. Such resources include those that are likely to be negatively impacted by human activities,[697] such as mining. Environmental governance requires the management of natural resources such as water, which is a critical resource. Therefore, environmental governance seeks to ensure the sustainable use of natural resources.[698] Environmental governance refers to aspects of institutional processes that seek to promote and prioritise sustainable environmental solutions.[699] Environmental protection is therefore included in decision-making processes at different levels.[700] Governance for environmental sustainability purposes in a country should therefore be driven especially by government's actions.

The primary purpose of environmental governance is to get the political, institutional, or organisational machinery to reach collective and specific environmental sustainability goals.[701] Environmental governance as a concept can serve the purposes of environmental sustainability in various ways.[702] One such way is the promotion of policy regarding environmental sustainability.[703] The ability to serve multiple purposes is what makes governance a complex concept.[704]

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[696] CH Eccleston & F March *Global Environmental Policy: Concepts, Principles, and Practice* (2011) xxxviii.
[697] Brandes "Practicing ecological governance: The case of the soft path for water" in *Making the Most of the Water We Have: The Soft Path Approach to Water Management* 65.
[698] J Newig & O Fritsch "Environmental governance: participatory, multi-level – and effective?" (2009) 19 *Environmental Policy and Governance* 197 202.
[699] Newig & Fritsch (2009) *Environmental Policy and Governance* 198.
[700] GC Daily, S Polasky, J Goldstein, PM Kareiva, HA Mooney, L Pejchar, TH Ricketts, J Salzman & R Shallenberger "Ecosystem services in decision making: time to deliver" (2009) 7 *Frontiers in Ecology and the Environment* 21 22.
[701] C Holley, N Gunningham & C Shearing *The New Environmental Governance* (2012) 12; D Jamieson "Climate change and global environmental justice" in CA Miller & PN Edwards (eds) *Changing the Atmosphere: Expert Knowledge and Environmental Governance* (2001) 287 287 & 293.
[702] LJ Kotzé "Environmental governance" in AR Paterson & LJ Kotzé (eds) *Environmental Compliance and Enforcement in South Africa: Legal Perspectives* (2009) 103 107-108.
[703] M Lockwood, J Davidson, A Curtis, E Stratford & R Griffith "Governance principles for natural resource management" (2010) 23 *Society and Natural Resources* 986 987.
[704] Lockwood et al. (2010) *Society and Natural Resources* 988; D Levi-Faur *The Oxford Handbook of Governance* (2012) 3; Bevir "Governance as theory, practice and dilemma" in *The SAGE Handbook of Governance* 1.

One goal of environmental governance for environmental protection is to achieve water sustainability.[705] This applies to the mining context as well as others. Achieving water sustainability means making critical decisions and planning for water protection by preventing or mitigating water pollution.[706] The achievement of environmental governance can be made possible by proper regulation of environmental issues. Therefore, decisions and planning regarding water protection require some degree of law enforcement to guarantee the "interests, needs, and values of all interested and affected parties".[707] The achievement of clean water resources in the mining sector, through environmental governance, is characterised by various management features as explained in the following discussion.

4 Features of Environmental Governance for Water Sustainability

Governance for environmental sustainability in the mining sector seeks to maintain better management of natural resources, including water resources.[708] The goal is to promote the continuous protection of the environment, specifically water preservation.[709]

Governance for water protection in the mining sector should seek to promote both regulatory and service functions for society as a whole, or in part.[710] Governance's regulatory function refers to the ability of governance actors to regulate a specific issue according to stated objectives.[711] The objectives include the discharging of administrative functions to meet the needs of communities, for example, or society as a whole.[712] The said objectives are carried out in such a way that the performance of

[705] R Duffy "Global environmental governance and the challenge of shadow states: the impact of illicit sapphire mining in Madagascar" (2005) 36 *Development and change* 825 839.
[706] Mudd (2008) *Mine Water and the Environment* 136-137.
[707] YS Tan, TJ Lee & K Tan *Clean, Green and Blue: Singapore's Journey Towards Environmental and Water Sustainability* (2009) xxiv; RA Irvin & J Stansbury "Citizen participation in decision making: is it worth the effort?" (2004) 64 *Public administration review* 55 55-56.
[708] Kemp et al. (2010) *Journal of Cleaner Production* 1559.
[709] Coetzee et al. *An Assessment of Sources, Pathways, Mechanisms and Risks* 136.
[710] P Rogers & AW Hall *Effective water governance* (2003) 4 & 11.
[711] AR Jahiel "The organization of environmental protection in China" (1998) 156 *The China Quarterly* 757 762.
[712] C Scott "Regulation in the age of governance: The rise of the post-regulatory state" in J Jordana & D Levi-Faur (eds) *The politics of regulation: Institutions and regulatory reforms for the age of governance* (2004) 145 153.

the authorities can be judged on that basis,[713] by society or monitoring bodies.[714] A service function of governance refers to authorities' duty to render services, such as the protection and provision of clean water resources for human beings and the natural environment.[715] The protection and provision of fresh water fall under environmental governance discussed below.

For purposes of this thesis, governance of water resources in the mining industry can be measured by various markers. The most important for the argument of this thesis are (i) decision making; (ii) planning; and (iii) law-enforcement.[716]

4.1 Decision-Making Process

Decision making is a key feature of governance for water management purposes, as a means to sustain safe water resources.[717] Any sustainable and acceptable action by stakeholders to achieve a lasting or sustained environment follows a proper decision-making process.[718] Decision making involves the making of choices between available alternatives, with the purpose of reaching a specific objective.[719] Though decisions can be made at all the times,[720] certain decisions are more likely to affect society or communities as part thereof.[721] For instance, environmental-related decisions made by administrative authorities affect not only an individual but the broader society.[722]

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[713] J Stern & S Holder "Regulatory governance: criteria for assessing the performance of regulatory systems: an application to infrastructure industries in the developing countries of Asia" (1999) 8 *Utilities Policy* 33 43; Ma, C-C & H-P Chang "Environmental Consciousness in Local Sustainable Development: A Case Study of the Anti-Idling Policy in Taiwan" (2019) 11 *Sustainability* 7.
[714] R Mulgan *Holding Power to Account: Accountability in Modern Democracies* (2003) 90.
[715] B Fisher, RK Turner & P Morling "Defining and classifying ecosystem services for decision making" (2009) 68 *Ecological Economics* 643 644.
[716] As this chapter focuses on the theoretical aspects of the markers, the discussion of governance principles/models embedded in the South Africa mining and water context is carried out in Chapters Six to Eight of this thesis.
[717] H Bulkeley & APJ Mol "Participation and environmental governance: Consensus, ambivalence and debate" (2003) 12 *Environmental Values* 143 144; VH Vroom & PW Yetton *Leadership and Decision-Making* (1973) 23; MM García, J Hileman & Ö Bodin "Collaboration and conflict in complex water governance systems across a development gradient" (2019) 24 *Ecology and Society* https://doi.org/10.5751/ES-11133-240328.
[718] RB Gibson "Beyond the pillars: sustainability assessment as a framework for effective integration of social, economic and ecological considerations in significant decision-making" (2006) 8 *Journal of Environmental Assessment Policy and Management* 259 259-260.
[719] HA Simon *Administrative Behaviour: A Study of Decision-Making Process in Administrative Organisations* 4th ed (1997) 1-2; CP Lim & LC Jain "Advances in intelligent decision-making" in LC Jain & CP Lim (eds) *Handbook on Decision Making: Vol 1: Techniques and Applications* (2010) 3 5.
[720] TL Saaty "Decision making with the analytic hierarchy process" (2008) 1 *IJSSci* 83 83 & 87.
[721] S Shakil & T Ananya "Effectiveness of environmental impact assessment (EIA): Bangladesh perspective" (2015) 12 *Bangladesh E-Journal of Sociology* 115 122.
[722] PC Stern & GD Brewer *Decision Making for the Environment: Social and Behavioral Science Research Priorities* (2005) 23.

On a regular basis, authorities make critical decisions that are the core of administration.[723] Those decisions form the base of governance processes. Decision making is one process of environmental governance through which decisions or actions are initiated as solutions in response to issues of concern such as water pollution.[724] Other attributes of administrative processes relating to environmental protection, such as planning and law enforcement, are highly dependent on decision-making processes.[725] Those attributes are also critical in a decision-making process since they are interdependent.[726]

A decision-making process related to environmental sustainability is the selection of ideas or a course of action among available alternatives.[727] A decision-making process in this regard is thus likely to lead to options that may result in environmental action.[728] This possibility to have alternatives or select options allows the decision-making body to identify or make choices depending on set targets and its preferences.

Furthermore, decision making can be understood as a problem-solving activity within which a satisfactory solution is adopted and applied.[729] Reaching an informed decision requires sufficient knowledge of the issue to be decided upon.[730] Similarly, the capacity of the person who makes decisions for purposes of water protection in the mining sector is important.[731]

The mining sector is strategic to many economies, including South Africa's. As a vital sector to the economy, it requires a determined decision-making authority to make common decisions applicable across the sector.[732] Even though different mining

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[723] JL McCamy "Analysis of the process of decision-making" (1947) 7 *Public Administration Review* 41 41-42.
[724] BS Pimentel, ES Gonzalez & GNO Barbosa "Decision-support models for sustainable mining networks: Fundamentals and challenges" (2016) 112 *Journal of Cleaner Production* 2145 2147 & 2149.
[725] McCamy (1947) *Public Administration Review* 41.
[726] RV Percival, CH Schroeder, AS Miller & JP Leape *Environmental Regulation: Law, Science, and Policy* 7th ed (2013) 39-40.
[727] Saaty (2008) *IJSSci* 83.
[728] L Chawla "Life paths into effective environmental action" (1999) 31 *The Journal of Environmental Education* 15 16.
[729] DW Lyon, GT Lumpkin & GG Dess "Enhancing entrepreneurial orientation research: Operationalizing and measuring a key strategic decision making process" (2000) 26 *Journal of Management* 1055 1059.
[730] Lyon et al. (2000) *Journal of Management* 1058.
[731] UNECE *2nd Environmental Performance Review: Kazakhstan* (2008) 151.
[732] A Sinha, P Malo, A Frantsev & K Deb *Multi-objective Stackelberg Game Between a Regulating Authority and a Mining Company: A Case Study in Environmental Economics* (2013) unpublished paper presented at the 2013 Ieee Congress on Evolutionary Computation 478; J Budds & L Hinojosa

companies may from time to time make decisions to ensure better water protection, such decisions may never have effects beyond the concerned company,[733] except if another company attempts to emulate the said decisions.[734] It is therefore unlikely that various operators in the mining sector can all make common decisions with a common purpose. In countries like South Africa, it is the State that controls natural resources on behalf of its citizens.[735] The state makes decisions relating to various aspects of mining, including the management of permitting processes,[736] relating to environmental protection.

For a similar purpose, the state takes actions which are known in administrative law as "administrative action".[737] An administrative action refers to decisions or actions taken by or on behalf of a state and which can affect residents of that state.[738] Thus, an administrative action is an act of state administrative bodies or officials acting on their behalf.[739] Actions of this nature seek, through decision-making, to make policy and carry out tasks provided in legislation, as state functions necessary for the running of state affairs and service delivery to people.[740] Due to the importance of administrative action, it is likely to be contested or taken on review if it does not comply with the applicable laws and lacks rationality,[741] as explained below.

In the South African administrative law, an administrative action refers to a decision of administrative nature taken or omitted by a state organ or any other person (natural and juristic) exercising public functions.[742] An action of a non-state organ is considered

"Restructuring and rescaling water governance in mining contexts: The co-production of waterscapes in Peru" (2012) 5 *Water Alternatives* 119 121.

[733] Budds & Hinojosa (2012) *Water Alternatives* 121.

[734] Mostert *Mineral Law:* 134.

[735] E Van der Schyff "South African mineral law: a historical overview of the state's regulatory power regarding the exploitation of minerals" (2012) 64 *New Contree* 131 132.

[736] Mostert *Mineral Law:* 83-84

[737] Preamble of PAJA.

[738] RA Cass "Models of Administrative Action" (1986) 72 *Va. L. Rev.* 363 364; US EPA *Environmental Administrative Decisions: The administrator and judicial officers, April 1985 to October 1989* (1995) 39-41.

[739] L Wolf "In search of a definition for administrative action" (2017) 33 *South African Journal on Human Rights* 314 316 & 322.

[740] E Vigoda "From responsiveness to collaboration: Governance, citizens, and the next generation of public administration" (2002) 62 *Public administration review* 527 529.

[741] FP Hubbard "Patterns of judicial review of administrative decisions" (1980) 12 *U. Tol. L. Rev.* 37 42-44; A Davison, Z Patel & S Greyling "Tackling wicked problems and tricky transitions: change and continuity in Cape Town's environmental policy landscape" (2016) 21 *Local Environment* 1063 1066.

[742] S 1 of PAJA; R Lyster "The effect of a constitutionally protected right to just administrative action" in M Harris & M Partington (eds) *Administrative Justice in the 21st Century* (1999) 376 381-382.

administrative if such action is authorised by an empowering provision.[743] An empowering provision is a law which authorises one to perform a public function.[744] In the context of this thesis, an administrative action is a decision making or failure to do so by a state organ or its proxy to prevent or mitigate water pollution in the South African mining sector.[745]

Due to the role of the state in managing the country's natural resources, it is natural that the government or its institutions are the appropriate decision-making authorities regarding water sustainability.[746] Such a position as the decision-making authority does not exclude the participation of or cooperation with other stakeholders.[747] Though decisions made by the government are likely to apply indiscriminately across the board, such decisions may not achieve consensus.[748]

The following discussion deals with what makes a decision-making process acceptable. The discussion highlights different models of decision-making processes that may determine when a decision achieves consensus. Such models are rationality, bounded rationality and communicative rationality models.

4.1.1 Rational Decision-Making Model

Rational decision-making is significantly addressed in legal requirements and case law in South Africa, as evidenced in Chapter Six of this thesis. However, the discussion in this section focuses precisely on the theoretical aspect of the rational decision-making concept to highlight the rationale informing effective administrative action.

Rational decision-making for the sustainable management of water resources occurs when choices are made from several alternatives that seek either to correct past failures to protect water resources efficiently or avoid such failures altogether.[749]

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[743] S 1(b) of PAJA.
[744] See definition of Administrative Action in S 1 of PAJA. See also the DOJ & CD "PAJA" (2019) <http://www.justice.gov.za/paja/about/action.htm> (accessed 31-10-2019).
[745] The meaning and interpretation of administrative action in terms of South African legislation and case law is discussed detailly in Chapters six and eight.
[746] Feris (2012) *Law Env't & Dev. J.* 4.
[747] N Funke, SHH Oelofse, J Hattingh, PJ Ashton & AR Turton "IWRM in developing countries: Lessons from the Mhlatuze Catchment in South Africa" (2007) 32 *Physics and Chemistry of the Earth, Parts A/B/C* 1237 1237 & 1244-1245.
[748] S Van Den Hove "Between consensus and compromise: acknowledging the negotiation dimension in participatory approaches" (2006) 23 *Land use policy* 10 12.
[749] F Di Castri "Global crisis and the environment" in GB Marini-Bettòlo (ed) *Study Week on a Modern Approach to the Protection of the Environment* (1989) 7 22; L Alfonso, MM Mukolwe & G Di Baldassarre

Decision-making to attain water protection is also rational when it aims to achieve equitable access to water for all.[750] As a result, the decision-making process follows an orderly path from problem to solution. Following an orderly path implies that rational decisions seek to optimise or maximise the positive effects of available solutions or tools.[751] Although the chosen solution is expected to align with the preferences and beliefs of the decisionmaker, it should be logical and reasonable.[752] Logic and reason mean that the decision must not be based on one's emotions.[753]

A rational decision is also expected to be objective by being unbiased and based on accurate and sufficient facts.[754] Important data is gathered for analysis to reach a rational decision.[755] During the analytical process, critical issues necessitating solutions are analysed to determine the feasibility and consequences of the decision or its alternative to be taken.[756] The risks and uncertainties of such decisions must be approached in a way that their clarification renders the understanding thereof possible.[757]

A decision-making process relating to environmental or water protection can only be considered rational if it meets the standards of reasonableness[758] and proportionality.[759] Reasonableness means the process must be fair and unbiased,[760] while proportionality refers to actions of which effects are neither below nor exceed

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"Probabilistic flood maps to support decision-making: Mapping the value of information" (2016) 52 *Water Resources Research* 1026 1027-1028.

[750] M Sagoff "Where Ickes went right or reason and rationality in environmental law" (1987) 14 *Ecology lq* 265 268-269.

[751] AL George "The "operational code": A neglected approach to the study of political leaders and decision-making" (1969) 13 *International Studies Quarterly* 190 200.

[752] Lockwood et al. (2010) *Society and Natural Resources* 992.

[753] AJ McGann *The Logic of Democracy: Reconciling Equality, Deliberation, and Minority Protection* (2006) 168; CJ McGuire *Environmental Decision-Making in Context: A Toolbox* (2012) 139.

[754] Sagoff (1987) *Ecology lq* 302.

[755] RA Brody & BI Page "Indifference, alientation and rational decisions" (1973) 15 *Public Choice* 1 2 & 4.

[756] SM Turpin & MA Marais "Decision-making: Theory and practice" (2004) 20 *Orion* 143 144.

[757] George (1969) *International Studies Quarterly* 198.

[758] C Courtis "Rationality, reasonableness, proportionality: Testing the use of standards of scrutiny in the constitutional review of legislation" (2011) 4 *Constitutional Court Review* 31 34; *Bato Star Fishing (Pty) Ltd v Minister of Environmental Affairs and Tourism and Others (CCT 27/03) [2004] ZACC 15,* para 30.

[759] LA Greening & S Bernow "Design of coordinated energy and environmental policies: use of multi-criteria decision-making" (2004) 32 *Energy Policy* 721 722.

[760] CJ Andrews & LJ Valbede Jr "Analysis in support of environmental decision-making report of the Working Group on Environmental Decision-Making" in I Linkov & AB Ramadan (eds) *Comparative Risk Assessment and Environmental Decision Making* (2006) 323 326.

required standards.[761] Such standards (reasonableness and proportionality) help to test the performance of public functionaries.[762]

It is important for rationality to meet such standards because it protects society against the abuse of power by decisionmakers.[763] The rationality standards are very likely to be met when the principle of rationality applies stringently.[764] This goal can be achieved by properly implementing the requirement of the test for rationality.

The rationality test refers to the establishing of principles that are capable to confirm whether given actions have followed due and defendable processes.[765] A decision-making process would, therefore, be rational if it is neither carried leniently nor variably.[766] Thus, no action or decision taken arbitrarily by an authority can be considered rational or pass the test since such a decision or action cannot be explained rationally.[767] In other words, no two instances of water pollution should be handled differently without rational justification.[768] That is providing a reasonable basis on which two unequal treatments have to be followed.[769] When such a basis does not exist, the rationality of decision-making processes can be qualified as "poor"[770] and cannot perceived as meeting the rationality test.[771]

Due to unforeseen circumstances, amongst others, it is unpredictable how rational a particular decisionmaker could be in the pursuit of water sustainability.[772] The alternatives to stringent rationality, as discussed below, highlight ways in which the rationality of the decision-making processes can be limited.

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[761] Greening & Bernow (2004) *Energy Policy* 722.
[762] AS Mathews *Freedom, State Security and the Rule of Law: Dilemmas of the Apartheid Society* (1986) 9.
[763] 70.
[764] JW Dean Jr & MP Sharfman "Procedural rationality in the strategic decision-making process" (1993) 30 *Journal of management Studies* 587 588 & 591; J Apesteguia & MA Ballester "A measure of rationality and welfare" (2015) 123 *Journal of Political Economy* 1278 1284-1285.
[765] R Nozick *The Nature of Rationality* (1993) 6.
[766] M Du Plessis & S Scott "The variable standard of rationality review: suggestions for improved legality jurisprudence" (2013) 130 *South African Law Journal* 597 616.
[767] *S v Makwanyane and Another (CCT3/94) [1995] ZACC 3*, para 156.
[768] JS Dryzek "Complexity and rationality in public life" (1987) 35 *Political Studies* 424 434.
[769] (CCT3/94) [1995] ZACC 3, para 156.
[770] L Percebois "Reconciling bounded rationality with the search for performance in public administration: Herbert Simon's perenial ideas vs. the new public management" in C Richter (ed) *Bounded Rationality in Economics and Finance* (2008) 167 179.
[771] *Minister of Constitutional Development and Another v South African Restructuring and Insolvency Practitioners Association and Others* [2018] ZACC 20, para 55.
[772] Dryzek (1987) *Political Studies* 424 & 437.

4.1.2 Bounded Rationality Model

Rational decision making for water protection in the mining sector cannot always be guaranteed in practice, as it can be difficult to achieve.[773] Such difficulty may be because certain decisionmakers lack knowledge of relevant existing facts, or because the future is unpredictable.[774] As a result, Simon proposes what is today known as "bounded rationality".[775] Bounded rationality is presented as an idea according to which chances of reaching a rational decision are very limited or rendered unfeasible.[776] The limitation is a result of various decision-related issues that render normal decision-making processes intractable.[777]

Rational decision-making is limited by three important issues. First, if decisionmakers lack required human capabilities to reach a rational decision, they become less likely to reach an equitable decision.[778] Required human capabilities are those that allow one to gather, process and understand the information required for the optimisation of a decision's outcome. Such an outcome is normally reached through rational decision-making processes.[779] However, factors linked to human capabilities that limit optimum decision-making can be mitigated if decisionmakers are equipped with such capabilities.[780] It is, therefore, necessary for instance, that government ensures as far as reasonably possible, that people entrusted with responsibilities such as control or management of water pollution have the required capabilities to handle such responsibilities.[781]

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[773] M Nilsson & H Dalkmann "Decision making and strategic environmental assessment" (2001) 3 *Journal of Environmental Assessment Policy and Management* 305 313; RP Eales & WR Sheate "Effectiveness of policy level environmental and sustainability assessment: Challenges and lessons from recent practice" (2011) 13 *JEAPM* 39 42.
[774] R Tannenbaum "Managerial decision-making" (1950) 23 *The Journal of Business of the University of Chicago* 22 25; Eales & Sheate (2011) *JEAPM* 56.
[775] HA Simon *Models of Man, Social and Rational: Mathematical Essays on Rational Human Behavior in a Social Setting* (1957) 199; HA Simon "Rational decision making in business organizations" (1979) 69 *The American Economic Review* 493 502.
[776] R Selten "What is bounded rationality?" in G Gigerenzer & R Selten (eds) *Bounded Rationality: The Adaptive Toolbox* (2002) 13 13-14.
[777] Simon (1979) *The American Economic Review* 502.
[778] WB Arthur "Inductive reasoning and bounded rationality" (1994) 84 *The American Economic Review* 406 406-407; Eales & Sheate (2011) *JEAPM* 56.
[779] Simon (1979) *The American Economic Review* 496.
[780] R Selten "Bounded rationality" (1990) 146 *Journal of Institutional and Theoretical Economics* 649 651 & 653.
[781] R Helmer & I Hespanhol *Water Pollution Control: A Guide to the Use of Water Quality Management Principles* (1997) 8-9.

Second, rationality can be limited due to lack of or poor cognition.[782] In that regard, the decisionmaker lacks reasoning and knowledge of the issue requiring a rational decision and, thus, is not able to apply the mind to the decision-making process.[783] Such a situation can be avoided if feasibility studies and consultations are done before the decision-making process to ensure that the decisionmaker is conscious of the magnitude of the task.[784] However, if such magnitude is known even before the task is assigned to a potential decisionmaker, measures are to be taken to ensure that the future decisionmaker is adequately instructed about the concerned issue.[785]

Third, time plays a vital role in reaching a rational decision.[786] Thus, when decisionmakers do not apply their minds or lack sufficient time to reach an optimum decision, the rationality of such a decision becomes questionable.[787] Possible decisions should be planned well ahead to have sufficient time to make optimum decisions.[788] However, it is unlikely that the authority involved would be able to plan ahead or have all the time needed to make rational decisions if the issue requiring rational decision-making takes them by surprise and requires an immediate solution.[789]

In the face of the above limiting factors, bounded rationality can become the likely option to pursue water preservation in South Africa's mining sector. Especially if no measures have been taken to ensure optimal decision-making or if it has not been possible to take such measures.[790] In that instance, decisionmakers can aim for satisfactory water management solutions rather than optimal ones.[791] The following

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[782] HA Simon "Bounded rationality in social science: Today and tomorrow" (2000) 1 *Mind & Society* 25 25.
[783] Simon (2000) *Mind & Society* 26.
[784] GA Kiker, TS Bridges, A Varghese, TP Seager & I Linkov "Application of multicriteria decision analysis in environmental decision making" (2005) 1 *Integrated Environmental Assessment and Management* 95 95 & 97.
[785] M Aulinas, JC Nieves, U Cortés & M Poch "Supporting decision making in urban wastewater systems using a knowledge-based approach" (2011) 26 *Environmental Modelling & Software* 562 570.
[786] T Grüne-Yanoff "Bounded rationality" (2007) 2 *Philosophy Compass* 534 555.
[787] 555.
[788] I Goll & AMA Rasheed "Rational decision-making and firm performance: the moderating role of the environment" (1997) 18 *Strategic Management Journal* 583 584; M Niño-Ruiz, ID Bishop & CJ Pettit "Increasing user awareness in environmental decision models through interactive steering" (2017) 167 *Landscape and Urban Planning* 128 129.
[789] PC Nutt "Investigating the success of decision making processes" (2008) 45 *Journal of Management Studies* 425 433.
[790] Goll & Rasheed (1997) *Strategic Management Journal* 584 & 589.
[791] Simon (2000) *Mind & Society* 26-27.

discussion highlights communicative rationality as another alternative to rational decision-making.

4.1.3 Communicative Rationality Model

Communicative rationality or communicative reason, as established by Habermas, refers to a theory that explains rationality as a potential outcome of positive communication.[792] This theory is concerned with clarifying the measures and ways by which common agreement can be reached through communication.[793] The theory suggests the view that reason is a form of human thinking that can gain public acceptance.[794] Acceptance in this instance is the ability of human reasoning to cause strong understanding and interaction with one another.[795] Such understanding and interaction are likely to occur because of clear communication, which results in a satisfactory solution.[796]

Communicative rationality aims to transform less explicit knowledge regarding issues like the control of water pollution in the mining sector into clear goals or courses of action.[797] The thinking here is that undistorted communication from one point to the other is likely to have a positive impact on the performance of decisionmakers on the receiving end.[798] Communicative rationality is criticised for sounding too utopian and idealistic.[799] The theory is criticised for failing to consider issues relating to inequality and human life affected or managed by political regimes.[800] Because society is characterised by inequality, undistorted communication does not necessarily guarantee that a decision-making process will achieve that which it is intended to achieve.[801] Also, should political authorities control issues such as management of water resources irrationally, it cannot be concluded that undistorted communication

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[792] J Habermas *The Theory of Communicative Action, Vol. 1: Reason and the Rationalization of Society* (1984) 2.
[793] Habermas *The Theory of Communicative Action* 2; MJ Ibuot & O Emeka "Meaning in Habermasian communicative rationality" (2019) 2 *JATREP* 86 87-88.
[794] SA Gunaratne "Public sphere and communicative rationality: Interrogating Habermas's eurocentrism" (2006) 8 *JCM* 93 96.
[795] Dryzek (1987) *Political Studies* 424 & 434.
[796] Habermas *The Theory of Communicative Action* 406.
[797] VS Saravanan, GT McDonald & PP Mollinga "Critical review of integrated water resources management: moving beyond polarised discourse" (2009) 33 *Natural Resources Forum* 5 & 10.
[798] Lockwood et al. (2010) *Society and Natural Resources* 992.
[799] M Devenney "The limits of communicative rationality and deliberative democracy" (2009) 2 *Journal of Power* 137 141.
[800] 137.
[801] Gunaratne (2006) *JCM* 150.

and resulting decisions in that regard will always have acceptable effects on human life.[802]

Though stronger water resources management can be achieved through decision-making and its models discussed above, those models alone are not sufficient.[803] Proper decision making for water preservation must be preceded or accompanied by adequate planning as discussed below.

4.2 Planning

Planning is an important aspect of all governance types, including environmental governance.[804] Planning in this context is the designing of given projects or actions.[805] In the environmental protection context, planning is understood as the establishment of a vision, strategies, the setting of implementation guidelines, and allocation of resources for decisionmakers to reach set targets such as water resource management.[806] This implies that planning is an anticipatory decision-making process, whereby future arrangements, aims and measures of action are predetermined.[807] Predetermining means that the planning process considers the characteristics of the system or organisation for which actions are planned.[808] Planning seeks primarily to establish how an organisation will achieve predetermined goals.[809] The planning process outlines the circumstances under which the said goals are determined.[810]

Similarly, the realisation of future goals is planned according to expectations and in an attempt to improve the current reality to reach the set goal.[811] For planning to be

[802] Dryzek (1987) *Political Studies* 441-442.
[803] A Schmolke, P Thorbek, DL DeAngelis & V Grimm "Ecological models supporting environmental decision making: A strategy for the future" (2010) 25 *Trends in Ecology & Evolution* 479 479-480.
[804] G Ioppolo, S Cucurachi, R Salomone, G Saija & L Shi "Sustainable local development and environmental governance: A strategic planning experience" (2016) 8 *Sustainability* 1 5.
[805] JE Innes & DE Booher *The impact of collaborative planning on governance capacity* (2003) 18.
[806] UNDP *Handbook on Planning, Monitoring and Evaluating for Development Results* (2009) 5.
[807] K Raczkowski *Public Management: Theory and Practice* (2015) 21.
[808] R Harding *Environmental Decision-making: The Roles of Scientists, Engineers, and the Public* (1998) 189.
[809] J Lautze, S De Silva, M Giordano & L Sanford "Putting the cart before the horse: Water governance and IWRM" (2011) 35 *Natural Resources Forum* 1 4.
[810] MB McCaskey "A contingency approach to planning: Planning with goals and planning without goals" (1974) 17 *AJM* 281 282.
[811] Raczkowski *Public Management:* 21.

effective, one must ascertain whether a project or duty being carried out in that regard by an individual or institution is in accordance with a predetermined plan.[812]

As far as achieving environmental sustainability through governance is concerned, planning encompasses the establishment of meaningful objectives and effective measures for the proper preservation of natural resources through future decision-making processes.[813] Establishing measures for resource preservation means ensuring through regulation, for instance, that there is constant access to freshwater resources.[814] The likelihood of success, as well as what may be required for future improvement of water quality, are also essential and must be evident.[815] Besides setting targets, planning involves a consultation phase where various actors and stakeholders, as well as interested parties, are engaged to ensure that there is some level of satisfaction.[816] In South Africa, a critical issue like water resources management falls directly under state control.[817] Therefore, whoever should be involved or seen as the authority responsible for planning must be a state official or authorised by the state.

As explained below, proper planning towards achieving governance for water management purposes requires good human capacity, prioritising, and flexibility, as well as timing.

4.2.1 Human Resource Capacity

Proper management or mitigation of water pollution depends significantly on human capacity.[818] Human capacity in this context means the necessary skills or expertise that a decisionmaker may possess.[819] A response or solution within a planning

[812] McCaskey (1974) *AJM* 285-286; Niño-Ruiz et al (2017) *Landscape and Urban Planning* 129-130.
[813] B Moldan, S Janoušková & T Hák "How to understand and measure environmental sustainability: Indicators and targets" (2012) 17 *Ecological Indicators* 4 11.
[814] *G Borrini, N Dudley, Ti Jaeger, B Lassen, P Neema, A Phillips & T Sandwith Governance of Protected Areas: From Understanding to Action (2013) Best Practice Protected Area Guidelines Series* 23.
[815] UNDP *Handbook on Planning, Monitoring and Evaluating for Development Results* 5.
[816] P Selman "Social capital, sustainability and environmental planning" (2001) 2 *Planning Theory & Practice* 13 14; Niño-Ruiz et al (2017) *Landscape and Urban Planning* 129-130.
[817] BJ Gareau & B Crow *Ken Conca, governing water: contentious transnational politics and global institution building* (2006) 320.
[818] P Van der Zaag "Integrated Water Resources Management: Relevant concept or irrelevant buzzword? A capacity building and research agenda for Southern Africa" (2005) 30 *Physics and Chemistry of the Earth, Parts A/B/C* 867 869.
[819] 869.

process can be successful if the decisionmaker has sufficient knowledge to offer or try new solutions to problems, particularly in circumstances where previous responses have failed to achieve any success.[820]

Human capacity can also help decisionmakers to be innovative.[821] Such innovation allows the planner to initiate novel thinking, which serves as a response to an actual or foreseen situation.[822] A novel idea can also serve as a response to an unforeseen circumstance.[823] The response must be appropriate to a particular targeted problem.

Innovative thinking requires a confluence of three critical components. First, the planner must have expertise in, or a fair level of understanding of, the domain or domains concerned with planning, [824] such as water management. Second, when planning for an issue such as water management, the planner must be capable and ready to make novel thinking an integral part of the planning process.[825] Third, and most importantly, there must be a proper justification to engage in the planned task.[826] The justification is supposed to include interest, willingness or challenge to steer things in the right direction as required under the law.[827]

In sum, proper planning is likely to result in an optimum output if, and when, a planner or decisionmaker endowed with required expertise is in charge of planning for environmental protection.[828] Expertise is required, especially where human capacity is essential for effective planning.[829] A planning process would be more successful

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[820] M Higgins & J Morgan "The role of creativity in planning: The'creative practitioner'" (2000) 15 *Planning Practice & Research* 117 118-119; Niño-Ruiz et al (2017) *Landscape and Urban Planning* 129.
[821] TJ Foxon, MS Reed & LC Stringer "Governing long-term social–ecological change: What can the adaptive management and transition management approaches learn from each other?" (2009) 19 *Environmental Policy and Governance* 3 8.
[822] RJ Sternberg & TI Lubart "The concept of creativity: Prospects and paradigms" in RJ Sternberg (ed) *Handbook of Creativity* (1999) 3 3 & 11; D Schneckenberg, V Velamuri, C Comberg & P Spieth "Business model innovation and decision making: Uncovering mechanisms for coping with uncertainty" (2017) 47 *R&D Management* 404 405.
[823] Sternberg & Lubart "The concept of creativity: Prospects and paradigms" in *Handbook of Creativity* 3; TM Amabile "Componential theory of creativity" (2012) Working Paper 12-096 <https://pdfs.semanticscholar.org/6188/5f52d813d518b4ed5b833b4022990211f063.pdf> (accessed 14-11-2019).
[824] TM Amabile *Creativity in Context: Update to the Social Psychology of Creativity* (2018) 77.
[825] 235-236.
[826] W Achterberg "From sustainability to basic income" in M Kenny & J Meadowcroft (eds) *Planning Sustainability* (2002) 128 143-144.
[827] Amabile *Creativity In Context:* 106.
[828] Selman (2001) *Planning Theory & Practice* 25.
[829] 27.

when the planner is equipped with strong domain expertise or understanding in creative thinking.[830] Such an ability overlaps with the features of rationality and thus likely to result in or promote rational decision making.[831]

Existing environmental issues, like water pollution, remain problematic.[832] Thus, as authorities plot the way forward to limit or eliminate water pollution, it is essential that they come up with innovative ideas in their planning processes.[833] If previous plans failed to produce successful outcomes, new efforts to combat water pollution cannot be planned similarly.[834]

Though human capacity is essential, a successful planner should also be able to prioritise and be flexible. These features are discussed next.

4.2.2 Priority and Flexibility

When planning for purposes of water resources in South Africa, prioritisation and flexibility are necessary as they highlight the need to protect the country's scarce water resources.[835] For governance purposes, prioritising refers to the process of identifying and directing more time and energy towards areas that are essential for the realisation of specific set goals.[836] The realisation can be done as per order of importance, time frames or time constraints to reach efficient outcomes.[837] In reality, it is highly unlikely that more than one time-consuming task can be completed simultaneously. Prioritising becomes critical where one task demands more time but is not as important as the other.[838]

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[830] CN Cook, S Inayatullah, MA Burgman, WJ Sutherland & BA Wintle "Strategic foresight: how planning for the unpredictable can improve environmental decision-making" (2014) 29 *Trends in Ecology & Evolution* 531 532.
[831] Cook et al. (2014) *Trends in Ecology & Evolution* 532-534.
[832] See section 3 of Chapter Two of this thesis.
[833] Cook et al. (2014) *Trends in Ecology & Evolution* 532 & 535.
[834] K Silvo, M Melanen, A Honkasalo, S Ruonala & M Lindström "Integrated pollution prevention and control—the Finnish approach" (2002) 35 *Resources, Conservation and Recycling* 45 48.
[835] AHM Gorgens & BW Van Wilgen "Invasive alien plants and water resources in South Africa: current understanding, predictive ability and research challenges: Working for Water" (2004) 100 *S. Afr. J. Sci* 27 32; Pollard & Du Toit (2008) *Water SA* 677.
[836] S Baker *In Pursuit of Sustainable Development: A Governance Perspective* (2009) 8th International Conference of the European Society for Ecological Economics, Ljubljana 8 & 12.
[837] S Kortmann, C Gelhard, C Zimmermann & FT Piller "Linking strategic flexibility and operational efficiency: The mediating role of ambidextrous operational capabilities" (2014) 32 *JOM* 475 475-476.
[838] Baker *In Pursuit of Sustainable Development:* 12.

Regarding environmental protection, proper planning requires the planner to identify areas where water resource management, for example, needs to be prioritised.[839] At times, the level of attention needed to reach a specific target may depend on the level of attention that the target is already receiving.[840] Thus, it may be much better to give preference to areas that are either receiving little or no attention.[841] These, for instance, can be areas where water resources face critical threats compared to those areas that are not or are less threatened.[842]

Even though decisionmakers establish priorities for the preservation of water resources, they or any other person tasked with the implementation of such priorities must also be able to improvise when circumstances change.[843] To improvise, flexibility is required.[844] Flexibility in the context of governance refers to the ability to take a new direction when plans unfold unexpectedly.[845] Flexibility is an essential skill to run contemporary organisations and institutions successfully.[846] It allows institutions to stay focused on their goals and increase their capacity to adjust and adapt to critical changes in their ever-changing environments.[847] A flexible water management body is likely to adopt different methods to deal with water pollution once existing methods become less effective.[848] One way of dealing with environmental concerns through governance may be by adopting stricter policies when current ones fail to yield expected results.[849] Flexibility can apply to both an operational and a strategic context.

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[839] Pollard & Du Toit (2008) *Water SA* 674.
[840] CR Groves, DB Jensen, LL Valutis, KH Redford, ML Shaffer, JM Scott, JV Baumgartner, JV Higgins, MW Beck & MG Anderson "Planning for biodiversity conservation: putting conservation science into practice: a seven-step framework for developing regional plans to conserve biological diversity, based upon principles of conservation biology and ecology, is being used extensively by the nature conservancy to identify priority areas for conservation" (2002) 52 *BioScience* 499 509.
[841] Kortmann et al. (2014) *JOM* 477.
[842] Groves et al. (2002) *BioScience* 509.
[843] EW Stein "Improvisation as model for real-time decision-making" in F Burstein, P Brézillon & A Zaslavsky (eds) *Supporting Real Time Decision-Making: The Role of Context in Decision Support on the Move* (2010) 13 14.
[844] 15.
[845] L Trigeorgis *Real Options: Managerial Flexibility and Strategy in Resource Allocation* (1996) 1 & 273.
[846] X Wang, Y Lu, Y Zhao, S Gong & B Li "Organisational unlearning, organisational flexibility and innovation capability: an empirical study of SMEs in China" (2013) 61 *IJTM* 132 134; Z Lonti & A Verma "The determinants of flexibility and innovation in the government workplace: Recent evidence from Canada" (2003) 13 *Journal of Public Administration Research and Theory* 283 306.
[847] MN Alolayyan, KAM Ali & F Idris *Examining the Relationship Between Operations Flexibility and Hospital Performance: A Structural Modelling Approach* (2011) Research Paper 271.
[848] MA Giordano & AT Wolf "Sharing waters: Post-Rio international water management" (2003) 27 *Natural Resources Forum* 163 170.
[849] Giordano (2003) *Natural Resources Forum* 164 & 170.

Operational flexibility refers to the capacity of decisionmakers to respond immediately to changes within an organisation, to enhance the operations of the organisation.[850] Strategic flexibility refers to an organisation's ability to take action immediately concerning significant modifications identified within its external environment, as well as to reverse existing commitments once a need arises.[851] Strategic flexibility equally requires an authority or planner to strike a balance between the commitment of resources to reach specific goals and avoiding involvement in projects that do not align with the organisation's goals.[852]

In the context of environmental protection, flexibility allows one to establish and shift from one environmental priority to another, once the need arises.[853] Flexibility also facilitates the experimentation of innovative approaches to tackle arising or previously unidentified environmental issues.[854] The purpose should be to reach a more sustainable outcome at an appropriate time, as discussed below.

4.2.3 Timing

Knowing when to plan for purposes of water governance helps to mitigate unnecessary adverse effects of mining on water resources, thus rendering decisionmakers responsive.[855] In any planning process, timing is supposed to be a key factor. Well-timed planning means that all actions to be carried out by leadership are planned or carried out at a given time.[856] Planning in this way entails making critical decisions at specific times and scheduling their implementation at the time when they matter the most.[857] It is important for the planner to have total control over the planned

[850] Trigeorgis *Real Options:* 15.
[851] K Shimizu & MA Hitt "Strategic flexibility: Organizational preparedness to reverse ineffective strategic decisions" (2004) 18 *Academy of Management Perspectives* 44 44.
[852] RH Freilich & JW Ragsdale Jr "Timing and Sequential Controls-The Essential Basis for Effective Regional Planning: An Analysis of the New Directions for Land Use Control in the Minneapolis-St. Paul Metropolitan Region" (1973) 58 *Minn. L. Rev.* 1009 1019; D Brozovic "Strategic flexibility: A review of the literature" (2018) 20 *International Journal of Management Reviews* 3 7-8.
[853] C Pahl-Wostl "Transitions towards adaptive management of water facing climate and global change" (2007) 21 *Water Resources Management* 49 51 & 59-60.
[854] RB Stewart "Models for environmental regulation: central planning versus market-based approaches" (1991) 19 *BC Envtl. Aff. L. Rev.* 547 553-554.
[855] JG Carter "Spatial planning, water and the Water Framework Directive: insights from theory and practice" (2007) 173 *Geographical Journal* 330 335 & 337.
[856] EF Harrison "A process perspective on strategic decision making" (1996) 34 *Management Decision* 46 51.
[857] D Gamage *Professional Development for Leaders and Managers of Self-Governing Schools* (2006) 140.

task to achieve good timing.[858] By having control, whoever is responsible for planning has a better understanding of all that is at stake.[859]

For purposes of environmental governance, thorough planning is required to render the achievement of water sustainability possible.[860] A way to achieve successful planning is by having a greater focus on the target when it matters the most.[861] Good planning for the purposes of water resource management can mean having well-designed thoughts that are capable of influencing and achieving positive results while mines are active or at closure phase.[862] Alternatively, proper timing should be a way by which planners or leadership fine-tune their use of time.[863] Appropriate timing is equally the manner in which leadership makes the most out of the time at its disposal to pursue set goals such as the protection of water resources.[864]

Authorities should act swiftly to prevent water pollution, and if a mine discharges polluted water into nearby streams, timely action[865] should also be taken by water management bodies to intervene.[866] Planning on time increases the possibility of decision-making processes to achieve positive outcomes.[867]

In conclusion, timing is the establishment of visions and strategies to be realised in the right place and at the right time.[868] As explained below, the success of best decisions and well-planned targets may, at times require a certain degree of law enforcement to yield positive outcomes. Hence, the following section addresses law enforcement for water governance purposes.

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[858] 218.
[859] Harrison (1996) *Management Decision* 46; Brozovic (2018) *International Journal of Management Reviews* 9.
[860] A Aylett "Participatory planning, justice, and climate change in Durban, South Africa" (2010) 42 *Environment and Planning A* 99 109.
[861] GA Steiner *Strategic Planning: What Every Manager Must Know* (2010) 267.
[862] Tiwary (2001) *Water, Air, and Soil Pollution* 195.
[863] Steiner *Strategic Planning* 282.
[864] Hilson & Nayee (2002) 64 *International Journal of Mineral Processing* 26.
[865] Because the thesis seeks at this point merely to set the theoretical basis of "timely action" as a feature of environmental governance, what such action entails administratively, legally or remedially is discussed in Chapters six and eight.
[866] JO Kempe "Review of water pollution problems and control strategies in the South African mining industry" (1983) 15 *Water Science and Technology* 27 58; Groenfeldt, David *Water ethics: A Values Approach to Solving the Water Crisis* 2nd ed (2019) 6 & 132.
[867] Cook et al. (2014) *Trends in Ecology & Evolution* 538.
[868] Freilich & Ragsdale Jr (1973) *Minn. L. Rev.* 1011.

4.3 Decision-Making for the Enforcement of Water Preservation Laws

Governance ensures the respect for, and promotion of, people's rights.[869] The effects of governance on people rights depend significantly on the effectiveness of governance, thus, decision-making processes.[870] Governance and human rights, including environmental rights are "mutually reinforcing".[871] Human rights principles serve as values to guide decisionmakers in their duties.[872] Similarly, human rights principles can serve as performance standards against which decisionmakers can be judged.[873] Such principles guide the development of legislative frameworks which can, in turn, inform the design and enforcement of governance features and principles.[874] However, governance, on its part is a precondition for the realisation of people's rights.[875] Ineffective environmental governance in the mining sector is very likely to hamper the proper respect of people's environmental rights.[876] Thus, the implementation of environmental rights relies to some extent on environmental governance.

Environmental protection can be more effective if authorities responsible for water protection make the enforcement of existing laws an integral part of their decision-making process.[877] Enforcing laws is critical in instances where some actors in a sector like mining are less concerned about water pollution.[878] Environmental law enforcement in the mining sector is thus a process by which those responsible for ensuring water protection assume the duty to enforce the law during decision-making processes in the following ways: (i) monitoring and evaluation of environmental violations and their perpetrators, (ii) deterring continued violations and (iii) enforcing environmental rehabilitation. These are discussed below.

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[869] LC Reif *The Ombudsman, Good Governance and the International Human Rights System* (2013) 125.
[870] 79.
[871] OHCHR *Good Governance Practices for the Protection of Human Rights* (2007)1-2.
[872] F Vanclay "International principles for social impact assessment" (2003) 21 *IAPA* 5 7.
[873] 7.
[874] M Sowman & A Brown "Mainstreaming environmental sustainability into South Africa's integrated development planning process" (2006) 49 *Journal of Environmental Planning and Management* 695 701.
[875] 701.
[876] S Pegg "Mining and poverty reduction: Transforming rhetoric into reality" (2006) 14 *Journal of Cleaner Production* 376 385-386.
[877] C Kwa "The rise and fall of weather modification" in CA Miller, PN Edwards, PPN Edwards, PM Haas, S Jasanoff & G Rochlin (eds) *Changing the Atmosphere: Expert Knowledge and Environmental Governance* (2001)135 150.
[878] Pegg (2006) *Journal of Cleaner Production* 379 & 385.

4.3.1 Monitoring and Evaluation of Environmental Violations

To promote water protection, one first has to detect whether and where there is a need for such protection.[879] Detection refers to the action or process of identifying something that may not be easily seen or not seen at all.[880] In other words, detection means becoming aware of something like pollution of underground water that may otherwise not be discovered or exposed.[881] One cannot proceed to enforce pollution control laws on a specific water source without knowledge of the fact that the water source is polluted and who is responsible.

Thus, the law must make provision to guide monitoring agents in the identification of any violation of rules and norms governing water protection in the mining sector.[882] It is also necessary to have provisions for the identification of the perpetrators of those violations.[883] Such identification means that the enforcement of laws as a feature of governance should be concerned with discovering areas where activities that are harmful or undesirable on water resources are being conducted.[884] The identification of such activities through monitoring guided by legal provisions is even more crucial when they are sufficiently harmful or threatening to warrant comprehensive prevention through legal means.[885]

It is vital to monitor and identify areas where those laws require enforcement to ensure the promotion of environmental rights in the mining sector.[886] Regarding water pollution, it is usually much easier to identify a polluted water source than to identify the perpetrator of such pollution, especially if it is surface water.[887] The difficulty arises

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[879] AE Edet & OE Offiong "Evaluation of water quality pollution indices for heavy metal contamination monitoring. A study case from Akpabuyo-Odukpani area, Lower Cross River Basin (southeastern Nigeria)" (2002) 57 *GeoJournal* 295 295 & 300-301.
[880] N Jaffrezic-Renault & S Dzyadevych "Conductometric microbiosensors for environmental monitoring" (2008) 8 *Sensors* 2569 2570.
[881] R Mota, FAM Santos, A Mateus, FO Marques, MA Gonçalves, J Figueiras & H Amaral "Granite fracturing and incipient pollution beneath a recent landfill facility as detected by geoelectrical surveys" (2004) 57 *Journal of Applied Geophysics* 11 12.
[882] LY Huang "Not just another drop in the human rights bucket: The legal significance of a codified human right to water" (2008) 20 *Fla. J. Int'l L.* 353 355 & 361.
[883] A Franz "Crimes against water: non-enforcement of state water pollution laws" (2011) 56 *Crime, Law and Social Change* 27 31 & 39.
[884] I Ehrlich "The optimum enforcement of laws and the concept of justice: A positive analysis" (1982) 2 *Int'l Rev. L. & Econ* 3 5.
[885] Ehrlich (1982) *Int'l Rev. L. & Econ* 5.
[886] Franz (2011) *Crime, Law and Social Change* 39.
[887] Franz (2011) *Crime, Law and Social Change* 45; H Thompson, CM Stimie, E Richters & S Perret *Policies, Legislation and Organizations Related to Water in South Africa, with Special Reference to the Olifants River Basin* (2001) 13.

from the fact that water moves or infiltrates from one point to another.[888] Therefore, if an authority is unable to identify where water pollution is occurring or has occurred, or its perpetrator, it is likely to hamper decision making furthering law enforcement in that area.[889] As a governance process, law enforcement would be effective if suspected water pollution is immediately investigated at the planning phase to establish its existence and location as well as its cause.[890] As highlighted below, the investigation allows the decision-making authority responsible for law enforcement to plan and adopt necessary measures to avoid further occurrence.

4.3.2 Deterrence of Further Violations

The law enforcement process *vis-à-vis* water protection should contain a deterring component.[891] Deterrence can be understood as the use of threats or necessary measures to cause an individual or organisation to refrain from initiating or carrying on with a course of action that is likely to produce or to further undesirable outcomes.[892] A threat is considered a deterrent when it attains its objective by putting an end to an unwanted course of action and its consequences.[893]

Successful deterrence depends on the proportionality of deterring measures taken.[894] The proportionality aspect ensures that the measures can achieve a positive outcome without having a destructive impact on the deterred party.[895] Proportionality in this context implies that the deterred party should have the capacity or means to respond positively to those measures. [896]

Deterrence is a concept that was employed before modern times to describe strategies or as dissuading tactics used by countries in times of conflict or tension.[897] In that

[888] RM Singh & B Datta "Identification of groundwater pollution sources using GA-based linked simulation optimization model" (2006) 11 *Journal of hydrologic engineering* 101 108.
[889] Franz (2011) *Crime, Law and Social Change* 28 & 30.
[890] Thompson et al. *Policies, Legislation and Organizations* 13.
[891] DM Kennedy *Deterrence and Crime Prevention: Reconsidering the Prospect of Sanction* (2012) 1.
[892] PK Huth "Deterrence and international conflict: Empirical findings and theoretical debates" (1999) 2 *Annual Review of Political Science* 25 26.
[893] DS Nagin & G Pogarsky "Integrating celerity, impulsivity, and extralegal sanction threats into a model of general deterrence: Theory and evidence" (2001) 39 *Criminology* 865 869.
[894] A Ristroph "Proportionality as a principle of limited government" (2005) 55 *Duke LJ* 263 331.
[895] DG Arce & T Sandler "Deterrence: credibility and proportionality" (2009) 21 *Economics & Politics* 384 385.
[896] Arce & Sandler (2009) *Economics & Politics* 386.
[897] CH Achen & D Snidal "Rational deterrence theory and comparative case studies" (1989) 41 *World Politics* 143 145; R Jervis "Deterrence theory revisited" (1979) 31 *World Politics* 289 290.

context, deterrence requires some form of reciprocity in terms of the defending state's losses and concessions by the threatening state.[898] Similarly, there is coercive credibility which urges concerned parties to realise what they stand to lose should one proceed to implement its threats or if the defending state fails to comply with the attacking state's request.[899] In this instance, cooperation could be a solution to deter without incurring too much cost, if any at all.[900]

In terms of environmental protection in the mining context today, deterrence is synonymous to the state's decision-making authority efforts to discourage or prevent environmental degradation by enforcing regulation.[901] The enforcement of regulations plays a vital role in preventing further environmental pollution.[902] Successful law enforcement within the governance process can be achieved through the discouraging of activities that are adversely affecting societal expectations such as safe water resources.[903] Effective ways of discouraging such activities through decision-making processes include first and foremost planning and setting objectives for those purposes.[904] Such objectives include pursuing, convicting and sanctioning perpetrators of environmental crimes.[905] Deterring effects involves urging perpetrators to include the reduction of pollution, improved environmental quality and inclusion of environmental protection measures within their pollution control processes.[906] One such measure that decisionmakers must plan for in the mining sector is the assurance that perpetrators avoid further environmental degradation by rehabilitating polluted environments as discussed below.

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[898] Jervis (1979) *World Politics* 290; Vandermeer, J, C Hosey, N Epley and B Keysar "Escalation of negative social exchange: Reflexive punishment or deliberative deterrence?" (2019) 84 *Journal of Experimental Social Psychology* 103823 2-3.
[899] B Jentleson *Coercive diplomacy: Scope and Limits in the contemporary world* (2006) The Stanley Foundation Policy Ananlysis Brief 2-3; Arce & Sandler(1979) *World Politics* 385.
[900] Jervis (1979) *World Politics* 297.
[901] D Thornton, NA Gunningham & RA Kagan "General deterrence and corporate environmental behavior" (2005) 27 *Law & Policy* 262 267-268.
[902] DN Dewees "The role of tort law in controlling environmental pollution" (1992) 18 *Canadian Public Policy* 425 426.
[903] N Gunningham, RA Kagan & D Thornton "Social license and environmental protection: why businesses go beyond compliance" (2004) 29 *Law & Social Inquiry* 307 308.
[904] RJ Burby & RG Paterson "Improving compliance with state environmental regulations" (1993) 12 *Journal of Policy Analysis and Management* 753 754-755.
[905] K Sander, J Lee, V Hickey, VB Mosoti, J Virdin & WB Magrath "Conceptualizing maritime environmental and natural resources law enforcement–The case of illegal fishing" (2014) 11 *Environmental Development* 112 118.
[906] Dewees (1992) *Canadian Public Policy* 431.

4.3.3 Enforcement of Environmental Rehabilitation

Decision making for water resource management must consider the means to restore a polluted water source.[907] In the mining sector, proper law enforcement has to include an environmental rehabilitation component.[908] Rehabilitation, in this context, refers to ensuring that a damaged environment is restored to a point where those dependent on the environment can find it suitable for their livelihood.[909] Due to the rapid decline of water resources in terms of both quantity and quality, it is critical to restore clean water resources as a basic natural resource for human use.[910] One aim of governance for environmental protection purposes is to ensure that a degraded environment is restored to its best possible state.[911] Limited, medium- or long-term interventions seeking the restoration of freshwater resources have become critical to address. Such intervention is necessary because the demand for mineral resources results in the degradation of the environment at an alarming rate.[912] An effective way to address such degradation is for authorities to enforce the replenishment of renewable natural capital.[913] As explained in Chapter Three ,[914] natural capital refers to the components of the natural environment that provide long-term benefits to the entire society.[915]

Regarding environmental governance, the enforcement of environmental protection laws is key to achieving a healthy environment.[916] Law enforcement is one process of governance that can truly influence different actors who have disregarded the law.[917] For environmental protection purposes, authorities are required to include law enforcement in their water management decision-making process.

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[907] M Van der Linde & L Feris *(eds) Compendium of South African Environmental Legislation* 2nd ed (2010) 61.
[908] Van der Linde & Feris *(eds) Compendium of South African Environmental Legislation* 57.
[909] Swart (2003) *SAIMM* 490.
[910] U Grünewald "Water resources management in river catchments influenced by lignite mining" (2001) 17 *Ecological Engineering* 143 149 & 151.
[911] D Limpitlaw, M Aken, H Lodewijks & J Viljoen *Post-mining rehabilitation, land use and pollution at collieries in South Africa* (2005) unpublished paper presented at the Colloquium: Sustainable Development in the Life of Coal Mining, South African Institute of Mining and Metallurgy, Boksburg 2.
[912] J Martínez-Paz, F Pellicer-Martínez & J Colino "A probabilistic approach for the socioeconomic assessment of urban river rehabilitation projects" (2014) 36 *Land Use Policy* 468 469.
[913] Martínez-Paz et al. (2014) *Land Use Policy* 468.
[914] As discussed in section 4.4 of the chapter.
[915] R Costanza, MA Wilson, A Troy, A Voinov, S Liu & J D'Agostino *The value of New Jersey's Ecosystem Services and Natural Capital* (2006) ii. See also section 4.4 of Chapter Three.
[916] A Sundström "Covenants with broken swords: Corruption and law enforcement in governance of the commons" (2015) 31 *Global Environmental Change* 253 255.
[917] 255.

5 Conclusion

The above discussion shows that governance is meant to achieve the optimum performance of individuals or organisations, through effective decision making.[918] It arises from the discussion that governance as a concept is complex, multifaceted and interdisciplinary.[919] The concept is complex because it does not have a standard definition and multifaced because it applies differently in different contexts.[920] Similarly, governance applies in various disciplines, including environmental management where it is termed environmental governance.[921]

Environmental governance came in to being to ensure environmental sustainability and the wellbeing of persons depending on the natural environment.[922] Environmental governance has the potential to achieve the protection of water resources in the mining sector.[923] However, as established in this chapter, for the proper protection of such resources to occur, the main features of environmental governance must be observed.[924]

First, proper protection of water resources requires effective decision making as the core feature of governance.[925] Effective decision-making processes rely on the principle of rationality for objective outcomes.[926] In the absence of rational decision making, alternatives such as bounded and communicative rationalities are to be considered bearing in mind that they have their limits as well.[927]

Second, for decision-making processes to yield positive results, decisionmakers must be able to plan strategically on how to reach set targets.[928] Achieving set targets requires to have planners with the required expertise.[929] The planner must be able to

[918] See section 4.1 of this chapter.
[919] Zumbansen (2010) *Comparative Research in Law & Political Economy* 9.
[920] See section 2 of this chapter.
[921] See section 3 of this chapter.
[922] Feris (2010) PELJ 76.
[923] Holley et al. *The New Environmental Governance* 12.
[924] See section 4 of this chapter.
[925] See section 4.1 of this chapter.
[926] As explained in section 4.1.1 of this chapter.
[927] As explained in sections 4.1.2 & 4.1.3 of this chapter.
[928] See section 4.2 of this chapter.
[929] Amabile *Creativity In Context:* 77.

prioritise while remaining flexible.[930] A successful planner is also expected to be able to identify a suitable time for critical decisions.[931]

Third, decision-making processes relating to water protection should involve the enforcement of laws relating to water protection.[932] Such enforcement requires the decisionmaker first to identify where there is a need for law enforcement.[933] Law enforcement also requires decisionmakers to stop or limit further pollution of water resources as much as possible and promote the rehabilitation of polluted water sources.[934]

The outcome of this chapter indicates that environmental governance is critical to achieving safe water resources in the mining sector.[935] It is thus possible that proper protection of water resources, at least to some extent, depends on environmental governance.[936] This leads to the conclusion that one way to promote environmental sustainability is through governance processes.

Although governance, as explained above, seems to be a promising solution in this context, its quality determines the effectiveness of decision-making processes. Governance is likely to achieve poor outcomes when its processes are poorly applied and can reach positive outcomes where such processes are properly applied.[937] The following chapter discusses good governance to highlight how governance in its best possible form can achieve water sustainability in the mining sector.

[930] Gorgens & Van Wilgen (2004) *S. Afr. J. Sci* 27; Pollard & Du Toit (2008) *Water SA* 677.
[931] Carter (2007) *Geographical Journal* 337.
[932] See section 4.3 of this chapter.
[933] Edet & Offiong (2002) *GeoJournal* 300.
[934] As explained in sections 4.3.2 & 4.3.3 of this chapter.
[935] Lockwood et al. (2010) *Society and Natural Resources* 987.
[936] Newig & Fritsch (2009) *Environmental Policy and Governance* 202.
[937] Pegg (2006) *Journal of Cleaner Production* 385-386.

CHAPTER FIVE: "GOOD" GOVERNANCE AND WATER SUSTAINABILITY

1. Introduction

As discussed in Chapter Four, one way to limit environmental issues, such as water pollution caused by mining, is by relying on environmental governance practices.[938] It is, however, argued in this chapter that the realisation of sustainable water resources in the mining context depends largely on "good" governance as a tool to render governance processes credible.[939]

If, as the previous chapter indicates, governance for purposes of water sustainability refers to decision-making processes aimed at water protection,[940] good governance refers to the quality of those decision-making processes.[941] As explained below, the quality of decision-making processes can be judged on the basis of decisionmakers' performance,[942] as well as their ability to achieve positive outcomes.[943]

Positive outcomes of good governance processes carried out through administrative actions[944] are very likely to boost the hopes of affected or vulnerable communities.[945] Such communities are most likely to be directly affected by any decision taken regarding water protection as they depend on safe water for their livelihood.[946]

To achieve the aim of this chapter, the discussions hereafter explain what makes governance "good". In so doing, the general meaning of the concept as well as its specific meaning in the context of water protection are highlighted. The characteristics of good governance are discussed to show how it can support water sustainability in

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[938] See section 3 of Chapter Four of this thesis.
[939] C Tortajada "Water governance: Some critical issues" (2010) 26 *IJWRD* 297 298.
[940] Y Keping "Governance and Good Governance: A New Framework for Political Analysis" (2018) 11 *FJHSS* 1 3 (a translation of the Chinese version published in 2001).
[941] Keping (2018) *FJHSS* 5; M Ali "Governance and Good Governance: A Conceptual Perspective" (2015) 10 *Dialogue* 65 69.
[942] SE Masten "Transaction costs, mistakes, and performance: Assessing the importance of governance" (1993) 14 *Managerial and Decision Economics* 119 125; C Holley, N Gunningham & C Shearing *The New Environmental Governance* (2012) 12; TG Weiss "Governance, good governance and global governance: Conceptual and actual challenges" (2000) 21 *Third World Quarterly* 795 800-801.
[943] D Kaufmann, A Kraay & P Zoido-Lobatón *Governance Matters: From Measurement to Action* (2000) Finance and Development 10; Tortajada "Water governance:" 298.
[944] See section 4.1 of Chapter Four.
[945] Tortajada (2010) *IJWRD* 301.
[946] SL Cutter "Race, class and environmental justice" (1995) 19 *Progress in Human Geography* 111 113.

the mining sector. This discussion highlights the difference that the implementation of good governance processes can make towards the pursuit of water sustainability.

2. Defining the Concept "Good" Governance

Generally, "good governance" has different connotations[947] depending on whether it is employed in the context of organisations or the corporate and public sectors.[948] In the context of public institutions, for instance, the concept is used to describe how public affairs and public resources must be conducted and managed respectively.[949] In that context, and for the purposes of this thesis, the concept, focuses on how effective administrative action[950] by government or state organs can achieve the state's constitutional mandate,[951] explained in the following chapter.[952]

The concept of good governance emerged as a standard to rate poor-performing economies or political institutions against well-performing ones.[953] Thus, the standards of good governance often used to rate the performance of developing countries are the state institutions of the West.[954] The main reason is that western states are perceived to be the "best performing" states in terms of governance practices.[955]

The emergence of the concept of good governance coincided with global historical and political changes towards the end of the 1980s.[956] These political changes led to ongoing discussions regarding how decisions concerning state affairs should be designed to achieve sustainable development, especially economic development.[957]

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[947] V Chhotray & G Stoker *Governance Theory and Practice: A Cross-Disciplinary Approach* (2008) 10; P Woodhouse & M Muller "Water Governance - An Historical Perspective on Current Debates" (2017) 92 *World Development* 225 225; Ali "Governance and Good Governance:" 66; L Devaney "Good governance? Perceptions of accountability, transparency and effectiveness in Irish food risk governance" (2016) 62 *Food Policy* 1 2.

[948] VP Nanda "The "good governance" concept revisited" (2006) 603 *ANNALS of the American Academy of Political and Social Science* 269 283.

[949] 270.

[950] As explained in section 4.1 of Chapter Four of this thesis.

[951] Nanda (2006) *ANNALS of the American Academy of Political and Social Science* 270.

[952] The next chapter explains the influence of the Constitution on decision making regarding water protection in the South African mining sector. See sections 2 and 3 of Chapter Six.

[953] PV Ngobo & M Fouda "Is 'Good'governance good for business? A cross-national analysis of firms in African countries" (2012) 47 *Journal of World Business* 435 435 & 438.

[954] 435.

[955] A Leftwich "Governance, democracy and development in the Third World" (1993) 14 *Third World Quarterly* 605 608-609.

[956] N Maldonado *The World Bank's Evolving Concept of Good Governance and its Impact on Human Rights* (2010) paper presented at the Doctoral workshop on development and international organizations, Stockholm, Sweden, May 4.

[957] Redclift (2005) *Sustainable Development* 221.

Good governance was then identified as critical to achieving sustainable development,[958] specifically in the developing world.[959] With specific reference to Sub-Saharan Africa, scholars identified that poor decision-making structures that lead to *inter alia,* poor economic performance[960] and abuse of human rights, could be attributed to poor governance practices.[961]

The World Bank[962] conducted a study[963] in 1989, primarily to analyse developmental issues in Sub-Saharan Africa.[964] These developmental issues included the fall in per capita income, high levels of poverty, the breakdown of social development and ecological degradation, due, to some extent, to poor decision making.[965] The use of the term "good governance" in the study indicates a specific meaning, according to the World Bank.

The World Bank's conception of good governance has become influential in many countries – specifically on the developing world's understanding and application of good governance.[966] The influence is caused by the World Bank's requirements regarding lending or financing for development projects.[967] The need for the World Bank's financing power urges potential candidates for funding to conform to the World Bank's understanding of good governance.[968] Consequently, from inception, the World Bank's definition became a universal standard when referring to good governance at the country level.[969]

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[958] P Hassan "Elements of good environmental governance" (2001) 6 *Asia Pac. J. Envtl L.* 1 9; MS Grindle "Good enough governance revisited" (2007) 25 *Development Policy Review* 533 558.
[959] Nanda (2006) *ANNALS of the American Academy of Political and Social Science* 271 & 273; S De la Harpe, C Rijken & R Roos "Good governance" (2008) 11 *PELJ* 2 3.
[960] World Bank *Accelerated Development in Sub-Saharan Africa: An Agenda for Action* (1981) 4.
[961] JK Akokpari "The AU, NEPAD and the promotion of good governance in Africa" (2004) 13 *Nordic Journal of African Studies* 243 243-244; Maldonado *The World Bank's Evolving Concept of Good Governance* 13.
[962] One of the institutions that expanded the use of the concept. See R Tripathi "Good governance: origin, importance and development in India" (2017) 7 *International Journal of Development Research* 16968 16968.
[963] World Bank *Sub-Saharan Africa: From Crisis to Sustainable Growth: A Long-Term Perspective Study* (1989).
[964] xi.
[965] 1-2.
[966] MS Grindle "Good enough governance: Poverty reduction and reform in developing countries" (2004) 17 *Governance* 525 533.
[967] Grindle (2004) *Governance* 527-528.
[968] 528.
[969] De la Harpe et al. (2008) *PELJ* 3 & 5; Keping (2018) *FJHSS* 2.

According to the World Bank,[970] good governance means the ability of the public service to achieve positive outputs and an administration that can respond positively to the expectations of its citizens.[971] Expectations in this instance include the ability to ensure economic and social welfare[972] while eradicating corruption and abuse of people's right amongst others.[973]

For the World Bank, good governance is a set of institutional reforms that are capable of achieving positive outcomes across different government departments.[974] These reforms are either political, economic, societal, legal or administrative.[975] The success of those reforms lies in the ability of a government or a decisionmaker to adopt, implement and enforce policies with the potential to achieve set targets, which are mostly developmental and political in nature.[976]

The World Bank's definition is in favour of economic development, while economic development is only one aspect of the wellbeing of a country.[977] Good governance, as discussed below, is, therefore, much more than just administrative processes aimed at developmental targets.[978]

Good governance concerning government processes is also about the responsibility of governments or decision-making bodies to respond to societal expectations.[979] Such expectations include positive outcomes, such as better protection of water resources.[980] In that regard, governance is mainly characterised by two core values: performance and procedure.[981]

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[970] MS Grindle "Good enough governance revisited" (2011) 29 *Development Policy Review* 199 205; HJ Chang *Kicking Away the Ladder: Development Strategy in Historical Perspective* (2003) 70.
[971] World Bank *Governance and Development* (1992) 1.
[972] World Bank *Sub-Saharan Africa: From Crisis to Sustainable Growth:* xii.
[973] World Bank *Governance and Development* 1 & 5.
[974] World Bank "The Governance Global Practice supports client countries to help them build capable, efficient, open, inclusive, and accountable institutions" (27-09-2018) Governance <http://www.worldbank.org/en/topic/governance/overview> (accessed 29-08-2019).
[975] SN Sangita "Administrative Reforms for Good Governance" (2002) *The Indian Journal of Political Science* 325 326.
[976] Grindle (2007) *Development Policy Review* 567; World Bank *World Development Report 1997: The State in a Changing World* (1997) 144.
[977] Guhan (1998) *Economic and Political Weekly* 187.
[978] MR Biju *Good governance and administrative practices* (2007) 23.
[979] G De Graaf & H Paanakker "Good governance: Performance values and procedural values in conflict" (2015) 45 *ARPA* 635 636.
[980] Grindle (2007) *Development Policy Review* 568.
[981] De Graaf & Paanakker (2015) *ARPA* 636.

Performance values refer to the output or outcome of the government's actions resulting from decision-making processes.[982] Therefore, performance as a core value of good governance means the extent to which a decision-making process is effective and efficient.[983] Effectiveness and efficiency as important pillars of good governance are discussed in detail below.

Procedural values, on the other hand, refer to the quality of processes employed by decisionmakers to reach specific targets.[984] A procedural value can serve as a basis to judge the extent to which decisionmakers are reliable or competent.[985] Such a value allows citizens to determine whether steps taken to provide results follow principles of good governance,[986] as discussed below.

Good governance is, therefore, a process used in public administration to refer to the maximisation of public wellbeing.[987] It is also seen as a process that enables collaboration between the state and citizens or civil society on the management of public life.[988] In that regard, good governance can be considered as a process whereby a system operates according to specific practices preferred by stakeholders to reach particular targets.[989]

Good governance in the environmental context refers to the effectiveness of a decision-making process in dealing with environmental concerns, such as water pollution.[990] That is how decisions are designed, executed and enforced to control water pollution caused by mining.[991]

Some scholars in the field of environmental law define good governance as a process of making and implementing decisions capable of achieving sustainability,[992] thus,

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[982] Biju *Good governance and administrative practices* 101.
[983] RI Rotberg "Good governance means performance and results" (2014) 27 *Governance* 511 512-513.
[984] De Graaf & Paanakker (2015) *ARPA* 2.
[985] 2.
[986] M Bevir *Democratic Governance* (2010) 107-108.
[987] J Viner "Bentham and JS Mill: The utilitarian background" (1949) 39 *AER* 360 362-363; Keping (2018) *FJHSS* 4.
[988] Keping (2018) *FJHSS* 5.
[989] World Bank "The Governance Global Practice".
[990] Feris (2010) PELJ 76 & 92.
[991] 75.
[992] P Martin, Z Li & T Qin *Environmental Governance and Sustainability* (2012) xix.

solving societal problems, such as water pollution.[993] Good environmental governance is also a symbol of a process through which decisionmakers continuously strive to achieve positive outcomes or outputs.[994] Thus, good environmental governance acceptable to most stakeholders and specifically vulnerable communities is a means to achieve a cleaner and safer environment.[995]

Good governance may be subjective for some stakeholders or concerned citizens, depending on their expectations and perception of a decision-making process.[996] However, for governance to be qualified as "good", decision-making processes or their outcomes must be acceptable to concerned or affected parties.[997]

Governance is "good" when actions of decisionmakers, as office bearers, seek to achieve various targets in the public interest.[998] For example, good governance would be achieved when the institution is designed, and functions, in a manner that ensures the promotion of water sustainability, which is a public good.[999]

The concept is criticised for failing to draw a distinction between states: States are structured differently and reforms cannot be as formulaic as the World Bank model might suggest.[1000] This position stems from the argument that good governance standards set by developed countries are imported into or imposed on developing countries.[1001] Such standards are inappropriate benchmarks for developing countries,

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[993] LJ Kotzé *Global Environmental Governance: Law and Regulation for the 21st Century* (2012) 62; M Falkenmark *On the Verge of a New Water Scarcity: A Call for Good Governance and Human Ingenuity* (2007) 15; F Gale "Tasmania's Tamar Valley pulp mill: A comparison of planning processes using a good environmental governance framework" (2008) 67 *AJPA* 261 272.
[994] Gale (2008) *AJPA* 261.
[995] J Harman *The Relationship between Good Governance and Environmental Compliance and Enforcement* (2005) Proceedings of the International Network for Environmental Compliance and Enforcement, Seventh International Conference, Marrakesh, Morocco 8.
[996] G Bouckaert & S Van de Walle "Comparing measures of citizen trust and user satisfaction as indicators of 'good governance': difficulties in linking trust and satisfaction indicators" (2003) 69 *International Review of Administrative Sciences* 329 331 & 338.
[997] 336.
[998] Weiss (2000) *Third World Quarterly* 805; JF Helliwell, H Huang, S Grover & S Wang "Empirical linkages between good governance and national well-being" (2018) 46 *Journal of Comparative Economics* 1332 1333.
[999] PJ Ashton, MJ Patrick, HM MacKay & AvB Weaver "Integrating biodiversity concepts with good governance to support water resources management in South Africa" (2005) 31 *Water SA* 449 450 & 454-455.
[1000] Guhan (1998) *Economic and Political Weekly* 187; Helliwell et al (2018) *Journal of Comparative Economics* 1341.
[1001] M Doornbos "'Good governance': The rise and decline of a policy metaphor?" (2001) 37 *Journal of Development Studies* 93 96-97.

as they do not have similar levels of development, resources, and political and institutional structures.[1002]

Similarly, countries can still develop themselves and achieve set targets without necessarily relying on good governance practices.[1003] It is argued that South Korea, Indonesia and parts of India, for instance, did not cease to grow in aspects such as development and poverty reduction, despite experiencing governance imperfections at some point in their histories.[1004]

Notwithstanding the above criticisms, this thesis argues that the quality of governance can be improved to achieve better results, such as stronger water protection, especially in instances where systems of governance with imperfections are not achieving positive outcomes. Such improved governance is measured against a set of elements that help stakeholders and concerned members of society to evaluate the merits and fairness of the process.[1005] Regarding water protection, the quality of governance is only justified by some of those elements, as discussed below.

3. Relevant Elements of "Good" Governance

The discussion on water sustainability outlined in Chapter Three indicates that water sustainability is achievable.[1006] Sustainable water resources are even more likely to be realised when measures are taken to incorporate good governance.[1007] Those measures include the implementation of elements characterising good governance discussed below. An understanding of such elements can answer the question as to what a decisionmaker must do to achieve water sustainability and when and how to do it.[1008]

Regarding water protection, only certain of the abovementioned elements are relevant: Cooperation is discussed as an essential element of good environmental governance.[1009] This section also explains accountability and its pillars, which are

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[1002] Doornbos (2001) 37 *Journal of Development Studies* 98; AR Riley "Good (native) governance" (2007) 107 *Colum. L. Rev.* 1049 1061; Grindle "Good enough governance:" 533.
[1003] M Andrews "The good governance agenda: Beyond indicators without theory" (2008) 36 *Oxford Development Studies* 379 380.
[1004] Grindle (2007) *Development Policy Review* 533.
[1005] S Agere *Promoting Good Governance: Principles, Practices and Perspectives* (2000) 7.
[1006] See section 3 of Chapter Three of this thesis.
[1007] Du Plessis & Nel "An introduction" in *Environmental Law and Local Government* 93.
[1008] Grindle (2007) *Development Policy Review* 525-526.
[1009] HA Strydom & ND King *Environmental Management in South Africa* (2009) 446.

(i) transparency of decisions or actions relating to environmental protection, as well as (ii) active public participation. Accountability helps to ensure that decision-making processes "respect, protect and fulfil" citizens' rights, including the right to clean water,[1010] while transparency promotes open and accountable decision making.[1011] Another element discussed herein is public participation which promotes accountability by acting "as a check"[1012] on decision-making processes.[1013] Efficiency and effectiveness are other elements of good governance, which play a vital role in determining the extent to which a decision-making process is successful.[1014]

3.1. Cooperation

The concept of cooperation is founded on the principle that issues of global concern are better dealt with by a group, compared to that which can be achieved individually.[1015] It is also founded on the principle that external support can very often determine how successful a person or an organisation becomes, even when dealing with unique issues.[1016] In today's world, addressing large-scale issues, like water pollution, require cooperation.[1017] Cooperation in this context refers to collaboration among people and organisations to overcome self-interest and the lonely pursuit of set goals.[1018] Set goals, including water sustainability, are therefore pursued in terms of better results.[1019]

As an element of good governance, cooperation regarding the achievement of water sustainability in the mining sector means the ability of concerned decisionmakers within government to facilitate inclusive approaches,[1020] for instance to protect water

[1010] A Du Plessis "Public participation, good environmental governance and fulfilment of environmental rights" (2008) 11 *PELJ* 170 177.
[1011] 188.
[1012] 183.
[1013] K Ahmed & Sanchez-TE *Strategic Environmental Assessment for Policies: An Instrument for Good Governance* (2008) 95.
[1014] C Schulz, J Martin-Ortega, K Glenk & AAR Ioris "The value base of water governance: A multi-disciplinary perspective" (2017) 131 *Ecological Economics* 241 242.
[1015] E Pennisi "On the origin of cooperation" (2009) *Science* 1196 1197-1198.
[1016] Pennisi (2009) *Science* 1198.
[1017] MA Nowak & K Sigmund *Evolution of Indirect Reciprocity by Image Scoring* (1998) Nature 1; T Forsyth "Cooperative environmental governance and waste-to-energy technologies in Asia" (2006) 5 *IJTMSD* 209 209.
[1018] Forsyth (2006) *IJTMSD* 211.
[1019] T Princen "Principles for sustainability: From cooperation and efficiency to sufficiency" (2003) 3 *Global Environmental Politics* 33 37.
[1020] A Du Plessis & R Alberts "Cooperative environmental governance: At the coalface of sustainable infrastructure development in South Africa" (2014) 29 *Southern African Public Law* 441 449.

resources.[1021] Cooperation is, therefore, the act of working together in the pursuit of a common goal, which may be to ensure the well-being of communities or society as a whole.[1022] Such welfare, from an environmental protection perspective, is achieved through policymaking, as well as the implementation and enforcement of existing laws.[1023]

In South Africa, the executive, in particular, is expected to cooperate as a consequence of its constitutional duty,[1024] and under the banner of co-operative government.[1025] Co-operative government, which is explained further in Chapter Six of this thesis seeks to achieve positive outcomes from decisions and actions taken through cooperated efforts between different spheres of government as well as between different government departments.[1026]

Cooperative governance in the pursuit of common interest, therefore, requires decisionmakers to provide assistance and support to one another.[1027] They must also inform each other of any such matters of common interest, as well as consult with one another.[1028] Cooperating further requires decisionmakers to perform administrative actions or make laws and policies in a coordinated manner.[1029]

Cooperation is critical in achieving water sustainability in the mining sector, where environmental protection directly concerns more than one government department.[1030] Cooperation between the departments ensures that useful ideas and opinions are

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[1021] D Malzbender, J Goldin, A Turton & A Earle *Traditional Water Governance and South Africa's "National Water Act"–Tension or Cooperation* (2005) paper presented at the International Workshop on 'African Water Laws: Plural Legislative Frameworks for Rural Water Management in Africa 2.
[1022] Du Plessis & Alberts "Cooperative environmental governance:" 449.
[1023] P Glasbergen "The question of environmental governance" in P Glasbergen (ed) *Co-operative Environmental Governance: Public-Private Agreements as a Policy Strategy* (1998) 1 1-2; S Taljaard, L van Niekerk & SP Weerts "The legal landscape governing South Africa'S coastal marine environment–Helping with the 'horrendogram'" (2019) 178 *Ocean & Coastal Management* 6.
[1024] H Ernste "Environmental governance and modern management paradigms in government and private industry" in P Glasbergen (ed) *Co-operative Environmental Governance: Public-Private Agreements as a Policy Strategy* (1998) 43 44; Taljaard et al (2019) *Ocean & Coastal Management* 2.
[1025] Chap 3 of the Constitution.
[1026] See section 2 of Chapter Six.
[1027] Kotzé "Environmental governance" in *Environmental Compliance and Enforcement in South Africa: Legal Perspectives* 122; S 41 of the Constitution.
[1028] L Malan "Intergovernmental relations and co-operative government in South Africa: The ten-year review" (2005) 24 *Politeia* 226 234 & 237.
[1029] Malan (2005) 24 *Politeia* 234.
[1030] Swart (2003) *SAIMM* 492; N Mirumachi & E Van Wyk "Cooperation at different scales: challenges for local and international water resource governance in South Africa" (2010) 176 *Geographical Journal* 25 27.

combined, thus complementing where one decisionmaker may be lacking.[1031] For instance, it is important that when dealing with water concerns in the mining sector, experts from different departments come to the table with different knowledge, solutions and techniques necessary to combat water pollution.[1032] Experts or decisionmakers who do not belong to the same field will not have a similar approach to things, even if they are dealing with a common matter of concern.[1033] Chapter Six and Seven provides more clarification as to why different departments may not approach water pollution in the mining sector in a similar manner.

This thesis argues that the pursuit and achievement of water sustainability in the mining sector as a matter of common or national interest depends on the extent to which various stakeholders can cooperate.[1034] This argument is founded on the basis that cooperation has the potential to transform society by achieving outcomes that would otherwise not be achieved individually or by a single stakeholder.[1035]

The fact that positive cooperation is likely to yield positive outputs increases the possibility of decisionmakers to be accountable.[1036] The following discussion highlights the meaning of accountability and its role in achieving water sustainability in the mining sector.

3.2. Accountability

Accountability plays a crucial role in the achievement of good environmental governance because it promotes the pursuit of accountable decision-making.[1037] Accountability refers to the ability to ensure that the actions, decisions and initiatives

[1031] Ashton et al. (2005) *Water SA* 453.
[1032] Ashton et al. (2005) *Water SA* 453.
[1033] A Driver, K Maze, M Rouget, AT Lombard, J Nel, JK Turpie, RM Cowling, P Desmet, P Goodman & J Harris *National spatial biodiversity assessment 2004: Priorities for biodiversity conservation in South Africa* (2005) 24-25.
[1034] T Moss "The governance of land use in river basins: prospects for overcoming problems of institutional interplay with the EU Water Framework Directive" (2004) 21 *Land use policy* 85 89 & 92.
[1035] S Jasanoff & ML Martello *Earthly Politics: Local and Global in Environmental Governance* (2004) 315.
[1036] RM Kramer, P Pommerenke & E Newton "The social context of negotiation: Effects of social identity and interpersonal accountability on negotiator decision making" (1993) 37 *Journal of Conflict Resolution* 633 639.
[1037] GI Seidman "The Origins of Accountability: Everything I Know About the Sovereign's Immunity, I Learned from King Henry III" (2004) 49 *Saint Louis ULJ* 393 395-396; J Plescia "Judicial accountability and immunity in Roman law" (2001) 45 *American Journal of Legal History* 51 57-58.

of decisionmakers can genuinely be justified or defended.[1038] Accountability, as understood around the exercise of state functions, is an assurance that individuals or institutions are judged according to their performance regarding their duties and responsibilities.[1039] This implies that accountability can serve as a performance enabler.[1040] Accountability as a performance enabler refers to a process through which the performance of an individual or an organisation can be evaluated based on their ability to execute actions for which they are rationally[1041] responsible.[1042] Thus, accountability can be understood as a process by which decisionmakers are urged and commit to delivering their best services as per the needs of stakeholders during decision-making processes and actions.[1043]

The importance of accountability lies in the fact that it allows for the monitoring and evaluation of decisionmakers' actions.[1044] Accountability requires all decisions to be reported and explained, which serves to limit the abuse of power.[1045] Thus, accountability in the context of water sustainability in the mining sector can serve to justify the basis, process or procedures followed in a water protection decision-making process.[1046]

Accountability is made up of three key aspects. First, the commitment of the authority responsible for promoting good governance is significant because a decisionmaker can be held responsible based on such commitment.[1047] In this respect, the authority is required to have the will to make a decision or take action and must do so in good

[1038] M Laver & KA Shepsle "Government accountability in parliamentary democracy" in A Przeworski, SC Stokes & B Manin (eds) *Democracy, Accountability, and Representation* (1999) 279 290; LJ Lefgren, B Platt, J Price and S Higbee "Outcome based accountability: Theory and evidence" (2019) 160 *Journal of Economic Behavior & Organization* 121 124.
[1039] R Mulgan "'Accountability': An ever-expanding concept?" (2000) 78 *Public Administration* 555 555.
[1040] JC Shin "Impacts of performance-based accountability on institutional performance in the US" (2010) 60 *Higher Education* 47 48-49.
[1041] As explained in section 4.1 of Chapter Four of this thesis.
[1042] P Cane *Administrative Law* 5 ed (2011) 363
[1043] Mulgan (2000) *Public Administration* 556.
[1044] Chhotray & Stoker *Governance Theory and Practice:* 51.
[1045] L Pellizzoni "Responsibility and environmental governance" (2004) 13 *Environmental Politics* 541 547.
[1046] Feris (2010) *PELJ* 74.
[1047] D Markell "Slack in the Administrative State and Its Implications for Governance: The Issue of Accountability" (2005) 84 *Or. L. Rev.* 1 55 & 58.

faith.[1048] Consequently, responsible authorities must be able to accept and defend the outcome of their actions; however well or poor they may appear.[1049]

Second, proper accountability requires strong motivations and reasons regarding choices of decisions made.[1050] In this respect, a decisionmaker is at all times expected to be able to justify his choices and strategies reasonably.[1051] In society, such expectations tend to be most critical when the outcome of a specific action fails to meet stakeholders' expectations.[1052] The need for a decisionmaker to motivate decisions regarding environmental protection cannot be neglected.[1053] For the decisionmaker, having to justify its actions reminds it that they cannot act irrationally without considering the consequences of the outcome of their acts.[1054]

Third, political science literature argues that, although decisionmakers in the domain of public administration have the authority to govern, their power should nonetheless be kept in check.[1055] To that end, decisions or actions taken by decisionmakers must be monitored by the governed to whom decisionmakers are answerable.[1056] The aim is to ensure that officials inform or explain and report on what they are doing or what they have done.[1057]

Regarding environmental sustainability in general and water protection in particular, accountability helps to hold decisionmakers responsible for the effects of their action

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[1048] T Prosser "Regulation and legitimacy" in J Jowell & D Oliver (eds) *The Changing Constitution* (2011) 321.
[1049] A Agrawal & J Ribot "Accountability in decentralization: A framework with South Asian and West African cases" (1999) 33 *The Journal of Developing Areas* 473 477; L Lebel, JM Anderies, B Campbell, C Folke, S Hatfield-Dodds, TP Hughes & J Wilson "Governance and the capacity to manage resilience in regional social-ecological systems" (2006) 11 *Ecology and Society* 19.
[1050] Pellizzoni (2004) *Environmental Politics* 549.
[1051] DL Schmoldt, J Kangas & GA Mendoza "Basic principles of decision making in natural resources and the environment" in DL Schmoldt, J Kangas, GA Mendoza & M. Pesonen (eds) *The Analytic Hierarchy Process in Natural Resource and Environmental Decision Making* (2001) 1 3-4; Prosser "Regulation and legitimacy" in *The Changing Constitution* 328.
[1052] AH Wandersman & WK Hallman "Are people acting irrationally? Understanding public concerns about environmental threats" (1993) 48 *American Psychologist* 681 681.
[1053] Wandersman & Hallman (1993) *American Psychologist* 684; N Overduin & M-L Moore "Social license to operate: Not a proxy for accountability in water governance" (2017) 85 *Geoforum* 72 73.
[1054] KA Bamberger "Regulation as delegation: private firms, decisionmaking, and accountability in the administrative state" (2006) 56 *Duke LJ* 377 426.
[1055] A Schedler "Conceptualizing accountability" in A Schedler, LJ Diamond & MF Plattner (eds) *The Self-restraining State: Power and Accountability in New Democracies* (1999) 13 13; S Gailmard "Accountability and Principal-Agent Theory" in M Bovens, RE Goodin & T Schillemans (eds) *The Oxford Handbook of Public Accountability* (2014) 90 95.
[1056] Schedler "Conceptualizing accountability" in *The Self-restraining State: Power and Accountability in New Democracies* 14.
[1057] 14.

on the environment.[1058] Holding decisionmakers responsible means that they are required to account for their actions, either collectively or individually.[1059] Decisionmakers are likely to be held accountable when their actions are likely to fail or have failed to achieve the desired environmental outcomes, such as stronger water resource protection and management.[1060]

Accountability regarding good environmental governance also implies the ability of decisionmakers to respond to the expectations of stakeholders.[1061] Such expectations, for example, may include the expectations of communities close to mine sites, to continue having access to unpolluted water resources.[1062] These expectations can be achieved through proper enforcement of environmental laws and policies that promote good governance practices.[1063] By so doing, decisionmakers are required not only to consider applicable environmental policies but to implement them as well.[1064]

Decision-making processes should conform to laws according to which well-established and defined rules for environmental protection are outlined.[1065] Proper application or enforcement of such laws eliminates the possibility of a decisionmaker or decision-making body acting irrationally, thus ignoring the impacts of its actions on other stakeholders.[1066] Similarly, no public official should act arbitrarily or unilaterally outside the bounds of office bearers' functions.[1067]

Proper accountability in terms of water protection is likely to happen once other vital elements of good governance, like transparency and public participation, become

[1058] Bamberger (2006) *Duke LJ* 424.
[1059] Simon *Administrative Behaviour:* 130-131 & 187.
[1060] TM Koontz & CW Thomas "What do we know and need to know about the environmental outcomes of collaborative management?" (2006) 66 *Public Administration Review* 111 115.
[1061] Wandersman & Hallman (1993) *American Psychologist* 681.
[1062] Kemp et al. (2010) *Journal of Cleaner Production* 1554.
[1063] World Bank "Accountability in governance" 1 <http://siteresources.worldbank.org/PUBLICSECTORANDGOVERNANCE/Resources/AccountabilityGovernance.pdf> (accessed 08-06-2016).
[1064] Kemp et al. (2010) *Journal of Cleaner Production* 1556.
[1065] MP Ferreira-Snyman & GM Ferreira "Global good governance and good global governance" (2006) 31 *South African Yearbook of International Law* 52 57.
[1066] F Schauer *Playing by the Rules: A Philosophical Examination of Rule-Based Decision-Making in Law and in Life* (1991) 173.
[1067] 173.

active, thus serving as catalysts.[1068] The discussion that follows argues that transparency can render accountability more effective.

3.2.1 Transparency and Access to Information

One factor that positively influences accountability, as discussed above, and good governance, in general, is the ability of decisionmakers to be transparent in their dealings and their outcomes.[1069] They do so by making information available[1070] to stakeholders and concerned members of society.[1071] The process through which decisionmakers provide stakeholders and affected or concerned members of society with access to information on critical issues affecting society is known as transparency.[1072] Transparency, therefore, means openness and access to unclassified or privileged information.[1073] Transparency also implies public access to relevant information that does not need to be classified or protected,[1074] especially information required on issues of interest to the public.[1075]

In the context of water protection, the aim of decisions and actions and the implementation of policies and their outcomes must be made public to affected or interested parties.[1076] Transparency must occur in such a way as to enable parties affected by environmental issues to have a better understanding of projects affecting, or likely to affect, their well-being.[1077] A good example is communities near mines.

With regard to mine communities, proper transparency depends on a number of factors. First, information released for transparency purposes must be accurate.[1078] Accuracy is necessary because stakeholders or affected parties can only have a

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[1068] TM Harrison & DS Sayogo "Transparency, participation, and accountability practices in open government: A comparative study" (2014) 31 *Government Information Quarterly* 513 514-516.
[1069] Harrison & Sayogo (2014) *Government Information Quarterly* 513; M Bauhr & M Grimes "Indignation or resignation: The implications of transparency for societal accountability" (2014) 27 *Governance* 291 292.
[1070] T Riley "A review of freedom of information around the world" (1982) 3 *J. Media L. & Prac.* 5 12; D Berliner "The political origins of transparency" (2014) 76 *The Journal of Politics* 479 480;
[1071] Bauhr & Grimes (2014) *Governance* 292.
[1072] S Bernstein "Legitimacy in global environmental governance" (2004) 1 *J. Int'l L & Int'l Rel.* 139 152.
[1073] A Gupta & M Mason "A transparency turn in global environmental governance" in A Gupta & M. Mason (eds) *Transparency in Global Environmental Governance: Critical Perspectives* (2014) 3 5.
[1074] A Gupta "Transparency under scrutiny: Information disclosure in global environmental governance" (2008) 8 *Global Environmental Politics* 1 2.
[1075] Bauhr & Grimes Bernstein 298 & 306.
[1076] Gupta (2008) *Global Environmental Politics* 5.
[1077] R Rumbu *Introduction to Mining Business Projects* 2nd ed (2018) 74.
[1078] SG Grimmelikhuijsen "Transparency of Public Decision-Making: Towards Trust in Local Government?" (2010) 2 *Policy & Internet* 5 15.

proper understanding of a project and its effects when they have the correct information.[1079] With accurate information, especially an exact idea of what is at stake, stakeholders are more likely to make informed decisions or take proper actions regarding matters of interest to them.[1080]

Second, information presented to concerned individuals must be consistent.[1081] Information delivered in that manner is likely to have a positive impact, especially when directed to interested parties.[1082] Consistency ensures that information received is not misleading.[1083] It thus boosts the confidence of affected or interested communities regarding making better, informed decisions, because of the certainty of the information presented to them.[1084]

Third, the timing to render information transparent is important.[1085] Thus, relevant information should be made available when it is most useful; that is, when stakeholders are more likely to play a meaningful role thanks to such information.[1086]

Fourth, not only must relevant information be delivered where and when required, but it must also be provided for a legitimate purpose.[1087] The primary motivation for providing specific information should be to enable informed decision making and thus to promote good governance through transparency.[1088] Information serves the purposes of good governance when it is presented with genuine intentions.[1089]

[1079] Grimmelikhuijsen (2010) *Policy & Internet* 9-10.
[1080] Borrini et al. *Governance of Protected Areas:* 4.
[1081] M Turilli & L Floridi "The ethics of information transparency" (2009) 11 *Ethics and Information Technology* 105 109.
[1082] C Reichard "The impact of performnce management on transparency and accountability in the public sector" in SP Osborne (ed) *Public Management: Critical Perspectives on Business and Management* (2002) 494 501.
[1083] Turilli & Floridi (2009) *Ethics and Information Technology* 106; E Armstrong *Integrity, transparency and accountability in public administration: Recent trends, regional and international developments and emerging issues* (2005) 1.
[1084] Borrini et al. *Governance of Protected Areas:*5-16.
[1085] Armstrong *Integrity, transparency and accountability in public administration:* 1; R Mwebaza "Improving environmental procedural rights in Uganda" in F Burhenne-Guilmin (ed) *Environmental Law in Developing Countries: Selected Issues* (2004) 1 7.
[1086] Armstrong *Integrity, transparency and accountability in public administration:* 1-2.
[1087] C Hoexter *Administrative Law in South Africa* 2nd ed (2012) 94.
[1088] Lockwood et al. (2010) *Society and Natural Resources* 993.
[1089] Hoexter *Administrative Law in South Africa* 94.

Transparent decision-making can facilitate better and rational management of water-related concerns in the mining sector.[1090] Transparency in that regard can help in promoting positive actions that can result in positive outcomes.[1091] The more transparent decisionmakers are, the more likely it is that affected parties will get involved in environmental decision-making.[1092] Transparent decision-making processes have the potential to ensure that interested parties are better informed compared to when there is a lack of transparency.[1093]

Transparency also helps in promoting the making and enforcement of decisions regarding water protection as provided by rules and regulations.[1094] This results from the fact that openness creates room for overseeing, pressurising or lobbying for environmentally-friendly practices, which puts decisionmakers in a position where the best option might only be to deliver on their commitments.[1095] When decisionmakers continuously strive to deliver on their obligations, there are better chances that such decisionmakers will be accountable.

Transparency, as explained above also has the potential to promote accountability, and that is what renders transparency and access to information key to achieving good environmental governance.[1096] Participation as discussed below can also promote a culture of accountability.

3.2.2 Public Participation

Very often during mining operations, as well as during and after the closure phase, vulnerable communities are left to carry the negative environmental consequences of mining, such as water pollution.[1097] Public participation is now commonly advocated

[1090] NL Poff, CM Brown, TE Grantham, JH Matthews, MA Palmer, CM Spence, RL Wilby, M Haasnoot, GF Mendoza & KC Dominique "Sustainable water management under future uncertainty with eco-engineering decision scaling" (2016) 6 *Nature Climate Change* 25 32.
[1091] Gupta (2008) *Global Environmental Politics* 1.
[1092] 3.
[1093] Hoexter *Administrative Law in South Africa* 95.
[1094] Mwebaza "Improving environmental procedural rights in Uganda" in *Environmental Law in Developing Countries: Developing Countries: Selected Issues* 6.
[1095] Grimmelikhuijsen (2010) *Policy & Internet* 13.
[1096] Mwebaza "Improving environmental procedural rights in Uganda" in *Environmental Law in Developing Countries: Selected Issues* 6-7.
[1097] See section 3 of Chapter Two of this thesis.

across the globe as a means to enable rational decision-making on how to mitigate the environmental impacts of activities such as mining.[1098]

Participation in decision-making processes refers to the process whereby different opinions are expressed and taken into consideration with the intention to achieve common objectives.[1099] Public participation is the expression of opinions regarding matters of interest, by members of the public - specifically interested and affected persons.[1100] Public participation is, therefore, the involvement in decision-making processes of persons likely to be affected by or interested in the outcome of a decision.[1101] In principle, public participation is a process through which those likely to be affected by a decision are enabled to influence the outcome of the decision-making process.[1102]

Despite the need for public participation, it is at times perceived as a hindrance to decision-making processes because it is time-consuming.[1103] Some communities, at times make requests believed to be unrealistic or difficult to realise due to time constraint or lack of capacity to respond to requests amongst which compensation for possible loss of livelihoods.[1104]

Nonetheless, it is still essential that vulnerable communities and concerned persons make inputs as far as a decision-making process is concerned to render decisionmakers more accountable.[1105] Concerned persons may include people with experience regarding ways in which mining harms the environment.[1106] Public

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[1098] C O'Faircheallaigh "Public participation and environmental impact assessment: Purposes, implications, and lessons for public policy making" (2010) 30 *EIA Review* 19 19.
[1099] O'Faircheallaigh (2010) *EIA* 20.
[1100] SL Senecah "The trinity of voice: The role of practical theory in planning and evaluating the effectives of environmental participatory processes" in SP Depoe, JW Delicath & MFA Elsenbeer (eds) *Communication and Public Participation in Environmental Decision Making* (2004) 13 14.
[1101] Senecah "The trinity of voice: The role of practical theory in planning and evaluating the effectives of environmental participatory processes" in *Communication and Public Participation in Environmental Decision Making* 13-14.
[1102] O'Faircheallaigh (2010) *EIA Review* 19.
[1103] F Li "Documenting accountability: Environmental impact assessment in a Peruvian mining project" (2009) 32 *PoLAR* 218 230; PC Stern & T Dietz *Public Participation in Environmental Assessment and Decision Making* (2008) 9.
[1104] Li (2009) *PoLAR* 230; PS Hofman "Participation in South East Asian pollution control policies" in F Coenen, D Huitema & LJ O'Toole (eds) *Participation and the Quality of Environmental Decision Making* (1998) 287 302.
[1105] X Wang & M Wan Wart "When public participation in administration leads to trust: An empirical assessment of managers' perceptions" (2007) 67 *Public Administration Review* 265 269.
[1106] V Petkova, S Lockie, J Rolfe & G Ivanova "Mining developments and social impacts on communities: Bowen Basin case studies" (2009) 19 *Rural Society* 211 212-213.

participation is key to promote good environmental governance as it ensures that decision-making processes take into consideration the opinions of the public or affected parties who can influence the process positively.[1107]

Participation in decision-making processes concerning environmental sustainability ensures that the public is aware of water protection measures, for example, and are voluntarily involved.[1108] Regarding good governance in the context of water resource management, public participation can be defined as a process by which those affected or likely to be affected by an environmental protection decision are involved in the decision-making process.[1109]

Active involvement of concerned communities or members of society willing to take part and influence a decision-making process may result in effective policy towards water protection.[1110] The main reasoning here is that proper participation can be a process that greatly influences good policymaking.[1111] Such type of policy has the potential to produce a positive outcome because concerned or affected parties must have participated in the decision-making process.[1112] Concerned parties may include experts whose involvement is critical since their knowledge is likely to influence a resulting decision or policy and its impacts critically.[1113]

An effective public participation process is based on essential key characteristics. First, it is based on the belief that all parties affected by a decision and its consequences deserve some form of involvement in that particular decision-making process.[1114] Such involvement offers an opportunity for the public to influence the decision where necessary and as far as possible.[1115] The sole aim of such influence

[1107] AN Glucker, PPJ Driessen, A Kolhoff & HAC Runhaar "Public participation in environmental impact assessment: why, who and how?" (2013) 43 *Environmental Impact Assessment Review* 104 105.
[1108] Feris (2010) PELJ 75-76.
[1109] KL Larson & D Lach "Participants and non-participants of place-based groups: An assessment of attitudes and implications for public participation in water resource management" (2008) 88 *Journal of Environmental Management* 817 818.
[1110] Larson & Lach (2008) *Journal of Environmental Management* 827.
[1111] Glucker et al. (2013) *EIA Review* 105.
[1112] Y Rydin & M Pennington "Public participation and local environmental planning: The collective action problem and the potential of social capital" (2000) 5 *Local Environment* 153 154.
[1113] G Rowe & LJ Frewer "Public participation methods: A framework for evaluation" (2000) 25 *Science, Technology, & Human Values* 3 8.
[1114] O Renn, T Webler, H Rakel, P Dienel & B Johnson "Public participation in decision making: A three-step procedure" (1993) 26 *Policy sciences* 189 190-191.
[1115] L Laurian "Public participation in environmental decision making: Findings from communities facing toxic waste cleanup" (2004) 70 *JAPA* 53 62.

should be to reach a fair decision, especially for the affected and especially the most affected.[1116]

Second, public participation should promote sustainable decisions through the acknowledgement and communicating of stakeholders' interests.[1117] The point is that it allows for the facilitation of the involvement of all parties directly affected by or interested in a decision.[1118] Therefore, the purpose of including participation in a decision-making process should always be to allow and encourage input from various participants to enable them to voice their specific concerns.[1119] Allowing participants to voice concerns ensures that all present and future interests of those directly affected or likely to be affected by the decision and its outcomes are taken into consideration.[1120]

Third, public participation should provide affected and concerned parties with the necessary information required for meaningful participation.[1121] Thus, access to information is required to enhance public participation.[1122] Participation of this magnitude is based on freedom of expression, assembly and association.[1123]

Public participation takes place in the form of consultation with interested persons or interest groups.[1124] Consultation is a process (often regulatory) by which the input of potential participants is sought on issues of interest to them.[1125] The main purpose of a consultation process is to ensure public involvement, transparency, as well as efficiency (discussed below) in decision-making processes relating to projects likely to affect people, as well as law and policymaking processes.[1126]

[1116] 56.
[1117] J de Vente, MS Reed, LC Stringer, S Valente & J Newig "How does the context and design of participatory decision making processes affect their outcomes? Evidence from sustainable land management in global drylands" (2016) 21 *Ecology and Society* <https://www.ecologyandsociety.org/vol21/iss2/art24/> (accessed 14-11-2019).
[1118] Graham et al. *Principles for good governance* 6.
[1119] GF Houston, R Humphries & I Liebenberg *Public Participation in Democratic Governance in South Africa* (2001) 8.
[1120] 272.
[1121] Principle 10 of the Rio Declaration on Environment and Development of 1992.
[1122] S Eden "Public participation in environmental policy: Considering scientific, counter-scientific and non-scientific contributions" (2016) 5 *Public Understanding of Science* 183 184.
[1123] Houston et al. *Public Participation in Democratic Governance* 2.
[1124] Eden (2016) *Public Understanding of Science* 185.
[1125] 198-197.
[1126] S Carver, A Evans, R Kingston & I Turton "Public participation, GIS, and cyberdemocracy: evaluating on-line spatial decision support systems" (2001) 28 *Environment and planning B: planning and design* 907 918.

Regarding water protection in the mining sector, public participation should be a process whereby communities affected or likely to be affected by the environmental impacts of mining are accorded opportunities to voice their concerns or suggestions.[1127] Public participation is critical in decision making relating to environmental protection in the mining sector because communities are the most vulnerable to and affected by issues such as water pollution.[1128]

Community participation in decision making can either take the form of direct involvement or representation[1129] by legitimate intermediate bodies such as non-governmental organisations that represent communities' interests.[1130] Consequently, everyone's opinion, including that of the less privileged and the most vulnerable, is taken into account in the decision-making process.[1131] It is usually the case during consultations leading to the start of mining activities in a specific area.[1132] Thus, when a successful public participation process occurs, a way is paved to reach common solutions to avoid or alleviate common environmental issues caused by mining.[1133]

Also, consultation attempts are made to satisfy various legitimate interests.[1134] The purpose of such consultation is to reach a broad consensus on what is in the best interest of all present and future community members.[1135] Responding to communities' best interest conforms to the Batho Pele[1136] Principles.[1137]

[1127] A Ahmad "Righting public wrong and enforcing private rights: Public involvement in Islamic Law" in CE Bruch (ed) *The New "public": The Globalization of Public Participation* (2002) 39 47-48.
[1128] See section 1 of Chapter One of this thesis.
[1129] Rowe & Frewer (2000) *Science, Technology, & Human Values* 8.
[1130] U Etemire *Law and Practice on Public Participation in Environmental Matters: The Nigerian Example in Transnational Comparative Perspective* (2015) 214.
[1131] S 2 (4) (g) NEMA.
[1132] G Whiteman & K Mamen *Meaningful consultation and participation in the mining sector?: a review of the consultation and participation of indigenous peoples within the international mining sector* (2002) 35.
[1133] TC Beierle & J Cayford *Democracy in Practice: Public Participation in Environmental Decisions* (2002) 67.
[1134] 4-5.
[1135] Etemire *Law and Practice on Public Participation in Environmental Matters:* 86.
[1136] "Batho Pele" is a Sotho word for "People First". See Republic of South Africa "White Paper on Transforming Public Service Delivery" (1997) *Government Gazette* 388 (18340) 13.
[1137] H Kroukamp "'Batho Pele': Putting the citizen first in transforming public service delivery in a changing South Africa" (1999) 65 *IRAS* 327 329; A Ehlers & CR Makanjee "Patient-centered care during gynaecological brachytherapy in terms of Batho Pele principles" (2018) 56 *South African Radiographer* 32 32.

Batho Pele Principles[1138] are a set of eight principles established and launched by the South African government to ensure good quality and improved public service to the people.[1139] The principles seek to ensure that state officials render to the people services to which they are entitled [1140] while ensuring that the people are consulted[1141] and informed[1142] in an open manner.[1143] With regard to decision making, the principles seek, among others, to promote accountability through transparency and access to information, as well as through public participation.[1144] In that regard, the principles require decisionmakers to be transparent and consult with communities, to ensure that their actions are fair to these communities.[1145]

In the context of mining, the principles promote accountable decision making regarding water protection through transparency and access to information which are likely to facilitate consultation with vulnerable communities.[1146] This is necessary because consultation has the potential to operationalise possible ways in which a consensus can be reached.[1147]

Through public participation, decisions (not only in the mining sector) are taken according to the will of the many, while simultaneously respecting the rights and legitimate interests of the few.[1148] For a public participation process to be successful, it is necessary that all obstacles regarding such participation or involvement be either limited or avoided entirely.[1149] An example of such obstacles could be an implicit obstruction from some policymakers who fail to understand the importance of

[1138] These principles are not law, but this thesis does not attempt to explain whether they are policy or guidelines as this fall beyond the scope of the thesis.
[1139] Republic of South Africa (1997) *Government Gazette* 388 (18340) 9 & 15.
[1140] 14.
[1141] Principle 1 of Batho Pele in Republic of South Africa "White Paper on Transforming Public Service Delivery" 15; Kroukamp (1999) *IRAS* 329-330.
[1142] Principle 5 of Batho Pele 15.
[1143] Principle 6 of Batho Pele 15.
[1144] M Mwaniki *Multilingualism and the Public Sector in South Africa* (2012) 170 & 175-176.
[1145] Z Mpehle "Are service delivery protests justifiable in the democratic South Africa?" (2012) 47 *Journal of Public Administration* 213 215; Republic of South Africa (1997) *Government Gazette* 388 (18340) 9.
[1146] Water Research Commission *How to Engage with Coal Mines through a Catchment Management Forum* SP 122/18 24.
[1147] Y Rydin *Conflict, Consensus, and Rationality in Environmental Planning: An Institutional Discourse Approach* (2003) 38; T Snell & R Cowell "Scoping in environmental impact assessment: balancing precaution and efficiency?" (2006) 26 *EIA Review* 359 368.
[1148] O'Faircheallaigh (2010) *EIA Review* 19.
[1149] Rydin & Pennington (2000) *Local Environment* 155.

transparency in consultation processes.[1150] In other instances, some policymakers may well understand the importance of transparency but deliberately choose not to present to communities what they are supposed to know.[1151]

This thesis argues that decisionmakers can promote public participation by being transparent in their dealings to promote good environmental governance in the mining sector.[1152] It is posited that such effort from decisionmakers stands a good chance to be successful if measures to reach good environmental governance are pursued effectively and efficiently.[1153] Effectiveness and efficiency are discussed hereafter as important elements of good governance.

3.3 Effectiveness and efficiency

One way to determine good environmental governance is through the effectiveness and efficiency of decision-making outcomes.[1154] That is whether they concern decisionmakers as individuals[1155] or an institution as a whole.[1156]

The term efficiency, frequently used in the field of economics,[1157] has made its way into the public administration literature in recent decades and is known as a core value of public administration.[1158] Economically, the concept of efficiency means the ability to reach anticipated results successfully while avoiding or limiting any waste of time and resources such as materials and funding.[1159] In essence, the concept signifies the effective utilisation of available input to acquire desired outputs without incurring unnecessary expenses and efforts amongst others.[1160]

[1150] 156.
[1151] 156.
[1152] Li (2009) *PoLAR* 225.
[1153] Newig & Fritsch (2009) *Environmental Policy and Governance* 197 198.
[1154] 198.
[1155] MR Rutgers & H van der Meer "The origins and restriction of efficiency in public administration: Regaining efficiency as the core value of public administration" (2010) 42 *Administration & Society* 755 772.
[1156] WN Adger, K Brown, J Fairbrass, A Jordan, J Paavola, S Rosendo & G Seyfang "Governance for sustainability: towards a 'thick'analysis of environmental decisionmaking" (2003) 35 *Environment and Planning A* 1095 1097.
[1157] JM Keynes *The General Theory of Employment, Interest, and Money* (2018) 120 125-126 (originally published in 1946).
[1158] Rutgers & van der Meer (2010) *Administration & Society* 772.
[1159] W Baldamus *Efficiency and Effort: An Analysis of Industrial Administration* (2013) 2.
[1160] 2.

In public administration, effectiveness can be defined as the ability to complete an expected task, while efficiency is the ability to achieve an expected outcome satisfactorily.[1161] Both concepts are achievable when decisionmakers make use of suitable and available resources for better outputs.[1162]

Regarding good environmental governance, the concepts can be understood as the ability of processes and institutions to produce results that meet the needs of society like water protection.[1163] It is difficult to establish the measurement that can be used to measure precise effectiveness and efficiency of decision making or administrative action.[1164] However, some markers can be relied upon to an extent to confirm the effectiveness and efficiency of decision-making processes.

First, effectiveness and efficiency can be determined by the relevance of a specific decision-making process.[1165] Relevance means how critical a particular action is towards the achievement of a set target like water sustainability.[1166]

Second, planning can determine how effective or efficient a decision can be as it identifies steps to be taken by administrators in the pursuit of given administrative actions.[1167] Different steps taken in preparing an action to counter water pollution, for instance, can determine the degree to which an action is successful, thus, its effectiveness and efficiency.[1168]

Third, the likely impact of an action can serve as a marker to determine the effectiveness and efficiency of a decision-making process.[1169] Impact refers to the

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[1161] P Eichhorn & I Towers *Principles of Management: Efficiency and Effectiveness in the Private and Public Sector* (2018) 99; DM Mihaiu, A Opreana & MP Cristescu "Efficiency, effectiveness and performance of the public sector" (2010) 4 *Romanian Journal of Economic Forecasting* 132 134.
[1162] Mihaiu et al. (2010) *Romanian Journal of Economic Forecasting* 145.
[1163] P Macnaghten & R Owen "Environmental science: good governance for geoengineering" (2011) 479 *Nature* 293 293; NL Poff, JD Allan, MA Palmer, DD Hart, BD Richter, AH Arthington, KH Rogers, JL Meyer & JA Stanford "River flows and water wars: emerging science for environmental decision making" (2003) 1 *Frontiers in Ecology and the Environment* 298 301.
[1164] PC Nutt "Comparing the merits of decision-making processes" in PC Nutt & DC Wilson (eds) *Handbook of Decision Making* (2010) 449 465.
[1165] J Neyer "Explaining the unexpected: efficiency and effectiveness in European decision-making" (2004) 11 *Journal of European Public Policy* 19 20-21.
[1166] 32.
[1167] F Calabrò & L Della Spina *Innovative Tools for the Effectiveness and Efficiency of Administrative Action of the Metropolitan Cities: The Strategic Operational Programme* (2014) Advanced Engineering Forum 5.
[1168] DP Loucks & E van Beek *Water Resource Systems Planning and Management: An Introduction to Methods, Models, and Applications* (2017) 34.
[1169] Snell & Cowell (2006) *EIA Review* 360.

actual effect that the outcome of a decision-making process or administrative action can have in dealing with an issue like water pollution, and on persons or stakeholders affected by and interested in the outcome.[1170]

It is difficult to envisage how such societal needs can be responded to if designed decision-making processes lack effectiveness and appropriate efficiency.[1171] Therefore, effective and efficient decision making for purposes of environmental sustainability and water resource management is equal to the ability of decisionmakers' actions to result in outcomes that meet stakeholder's expectations.[1172]

Expectation refers to the belief that something could occur in future.[1173] Such expectations can include the protection and assurance of access to water in general and clean water in particular in future.[1174] Ensuring access to water is critical as far as vulnerable communities are concerned because it guarantees them their livelihoods.[1175]

Other elements of good governance, such as accountability and transparency, are more likely to be justified when a given decision-making process is effective and efficient.[1176] In that regard, decision making is more likely to achieve intended outcomes satisfactorily when a specific method is followed by an established system of governance guided by sound policies.[1177]

Effectiveness and efficiency as essential elements of good governance play two critical roles. First, by judging decisionmakers based on their effectiveness and efficiency, affected or concerned members of society can identify specific areas in

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[1170] DP Loucks "Sustainable water resources management" (2000) 25 *Water international* 3 3 & 7.
[1171] J Shortle & RD Horan "Policy instruments for water quality protection" (2013) 5 *Annu. Rev. Resour. Econ.* 111 113, 125 & 131.
[1172] Adger et al. (2003) *Environment and Planning* 1096-1097.
[1173] RL Sims & TL Keon "The influence of organizational expectations on ethical decision making conflict" (2000) 23 *Journal of Business Ethics* 219 220.
[1174] K Moffat & A Zhang "The paths to social licence to operate: An integrative model explaining community acceptance of mining" (2014) 39 *Resources Policy* 61 64; F Khan "The roots of environmental racism and the rise of environmental justice in the 1990s" in DA McDonald (ed) *Environmental Justice in South Africa* (2002) 15 29.
[1175] Khan "The roots of environmental racism and the rise of environmental justice in the 1990s" in *Environmental Justice in South Africa* 29.
[1176] Pellizzoni (2004) *Environmental Politics* 543.
[1177] 543 & 560.

which they have failed.[1178] Secondly, effectiveness and efficiency serve as yardsticks for accountable decisionmakers to perform self-evaluation and identify areas where improvement is required.[1179] In so doing such decisionmakers are likely to be responsive.[1180]

In the context of public administration, responsiveness refers to the ability of decisionmakers or institutions to discharge given duties in a manner that is beneficial to society and within a reasonable timeframe.[1181] A decision-making process is thus more likely to be responsive when all possible implications and alternative courses of action are explored thoroughly and objectively.[1182] Similarly, responsive decision-making relating to water sustainability largely depends on reliable data for an informed decision to be made.[1183]

Though it is important for specific decision-making processes to take place promptly, it must, however, be emphasised that responsiveness does not imply that a decisionmaker has to act hastily without considering the adverse outcomes of such hasty decision making.[1184] Outcomes of decision-making processes are vital; thus, responsive decision making requires careful consideration of available options and the potential consequences of the process.[1185] Failure to do so is likely to result in poor governance, which is an indication that the decision-making process is flawed, and therefore, cannot possibly achieve a positive outcome.[1186]

The above discussion shows that each element of good environmental governance has a significant role to play in achieving sustainable water resources in the mining

[1178] WN Adger, NW Arnell & EL Tompkins "Successful adaptation to climate change across scales" (2005) 15 *Global Environmental Change* 77 81.
[1179] K LeRoux & NS Wright "Does performance measurement improve strategic decision making? Findings from a national survey of nonprofit social service agencies" (2010) 39 *Nonprofit and Voluntary Sector Quarterly* 571 573.
[1180] Graham et al. *Principles for good governance* 3.
[1181] Vigoda (2002) *Public Administration Review* 528.
[1182] Simon *Administrative Behaviour:* 1-2; Sagoff (1987) *Ecology Iq* 302.
[1183] Turpin & Marais (2004) *Orion* 144.
[1184] M Naruse, E Yamamoto, T Nakao, T Akimoto, H Saigo, K Okamura, I Ojima, G Northoff & H Hori "Why is the environment important for decision making? Local reservoir model for choice-based learning" (2018) 13 *PloS One* 1 2.
[1185] Vigoda (2002) *Public Administration Review* 528.
[1186] Vigoda (2002) *Public Administration Review* 528.

sector. Thus, indicating that the quality of governance is key in achieving positive outcomes.[1187]

4 Conclusion

This chapter shows that good governance seeks to ensure that the performance of decisionmakers is targeted through governance in its best possible form.[1188] It also emerges from this chapter that good governance, for purposes of environmental protection, in general, and water sustainability, in particular, is a crucial pillar in the overall structure of this thesis. Thus, the concept of good environmental governance as explained above provides insight on what is to be expected from decisionmakers as far as good governance practices are concerned.[1189]

Following highlights in this chapter, it can be concluded that the quality of governance is critical in attempts to achieve positive outcomes such as sustainable water resources in the mining sector.[1190] Consequently, good environmental governance, as defined above, is a theory that can serve as a guideline for effective decision making.[1191] Similarly, the theory is a tool for the governed or concerned communities or persons to evaluate the performance of decisionmakers.[1192]

One essential insight in this chapter is that for decision-making outcomes to be perceived as involving good governance practices, they must have included the essential elements of good governance[1193] highlighted above.[1194] The critical role of these elements lies in the fact that they promote cooperation among decisionmakers for effective action.[1195] They also offer guidelines regarding how decisionmakers can become accountable by taking the necessary steps to deliver as well as being

[1187] Keping (2018) *Fudan Journal of the Humanities and Social Sciences* 5.
[1188] K Hogl, E Kvarda, R Nordbeck & M Pregernig "Legitimacy and effectiveness of environmental governance - concepts and perspectives" in K Hogl, E Kvarda, R Nordbeck & M Pregernig (eds) *Environmental Governance: The Challenge of Legitimacy and Effectiveness* (2012) 1 5-6.
[1189] See section 2 of this chapter.
[1190] Hogl et al. "Legitimacy and effectiveness of environmental governance - concepts and perspectives" in *Environmental Governance: The Challenge of Legitimacy and Effectiveness* 2
[1191] See section 2 of this chapter.
[1192] Masten (1993) *Managerial and Decision Economics* 125.
[1193] EC *European Governance - A White Paper* (2001) 27; Hogl et al. "Legitimacy and effectiveness of environmental governance - concepts and perspectives" in *Environmental Governance: The Challenge of Legitimacy and Effectiveness* 6.
[1194] See section 3 of this chapter.
[1195] Pennisi (2009) *Science* 1197-1198.

transparent and listening to the public.[1196] Similarly, those elements show how decision making can become effective and efficient with the potential to achieve intended outcomes.[1197]

It can be deduced from the above that when decision-making processes involve honest cooperation accompanied by transparency in all attempts to reach water sustainability, public participation is facilitated.[1198] Consequently, where cooperation, transparency and participation are guaranteed, it becomes fertile ground for decisionmakers to remain continually accountable.[1199] Proper accountability is likely to render decision-making processes rational and thus effective and efficient.[1200] A responsible decisionmaker has the potential to be rational due to being driven by effective and efficient decision-making habits.[1201]

The discussions in this Part Two have explained the concepts that serve the theoretical basis of this thesis. Part Three analyses how those concepts are addressed in the South African legal framework, with a specific focus on water protection in the South African mining sector.

[1196] See section 3.2 of this chapter.
[1197] EC *European Governance - A White Paper* 27.
[1198] Kramer et al. (1993) *Journal of Conflict Resolution* 639; Harrison & Sayogo (2014) *Government Information Quarterly* 513.
[1199] P Krütli, M Stauffacher, T Flüeler & RW Scholz "Functional-dynamic public participation in technological decision-making: Site selection processes of nuclear waste repositories" (2010) 13 *Journal of Risk Research* 861 862.
[1200] Mulgan (2000) 78 *Public Administration* 556.
[1201] See section 4.1.1 of Chapter Four of this thesis.

CHAPTER SIX: EMBEDDING THE REALISATION OF WATER SUSTAINABILITY THROUGH DECISION MAKING IN THE SOUTH AFRICAN LEGAL FRAMEWORK

1 Introduction

The "social and environmental fabric" of South Africa is significantly affected by mining,[1202] and thus, should be regulated. The realisation of environmental sustainability requires the existence of measures that factor in the needs of present and future generations.[1203] The protection and management of water resources in the mining sector is critical to ensure continuous access to safe water.[1204]

Water sustainability is the best way to protect and manage water resources, which are essential for the survival and well-being of not only humans but other living organisms too.[1205] Sustainability, as defined in Chapter Three, guides decisionmakers to avert the adverse impacts that human actions can have on the availability of safe water resources.[1206] This helps to ensure the uninterrupted provision of safe water for all living beings.[1207] Water sustainability may be achievable if measures to protect and preserve water resources are embedded in law and governance practices, as highlighted in Chapter Four.[1208] Similarly, for water sustainability to be a realistic goal, good governance practices must be prioritised.[1209]

Achieving water sustainability depends on, among others, the existence and implementation of a legal framework that promotes sustainability.[1210] The legal framework must furthermore be capable of achieving water sustainability by being

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[1202] J Glazewski *Environmental law in South Africa* 455.
[1203] T-L Humby "Environmental justice and human rights on the mining wastelands of the Witwatersrand gold fields" (2013) 43 *Revue Générale de Droit* 67 74.
[1204] JG Hering & KM Ingold "Water resources management: what should be integrated?" (2012) 336 *Science* 1234 1234.
[1205] See section 3 of Chapter Three of this thesis.
[1206] DP Loucks & JS Gladwell *Sustainability Criteria for Water Resource Systems* (1999) 30; LW Mays *Water Resources Sustainability* (2007) 4.
[1207] I Juwana, N Muttil & BJC Perera "Indicator-based water sustainability assessment—A review" (2012) 438 *Science of the Total Environment* 357 360. C Pahl-Wostl, A Arthington, J Bogardi, SE Bunn, H Hoff, L Lebel, E Nikitina, M Palmer, LN Poff & K Richards "Environmental flows and water governance: managing sustainable water uses" (2013) 5 *Current Opinion in Environmental Sustainability* 341 342.
[1208] See section 4 of Chapter Four.
[1209] See Chapter Five above.
[1210] A Du Plessis "South Africa's constitutional environmental right (generously) interpreted: What is in it for poverty?" (2011) 27 *SAJHR* 279 301.

specific and enforceable.[1211] Given the likely future of South Africa's water resources,[1212] the law should play a key role in its preservation.[1213] This role involves aiming to prevent or mitigate water pollution resulting from mining.[1214]

Since the second half of the twentieth century, increased awareness of environmental issues has resulted in improved regulation of the mining sector in relation to its adverse effects on water resources.[1215] This includes regulations dealing with the impact of mining[1216] visible in multiple regions across South Africa, where the adverse effects of mining, including water pollution are raising serious concerns.[1217]

This chapter analyses the potential of the current South African legal framework to promote water sustainability through effective decision-making processes.[1218] In this regard, the chapter analyses efforts by the law to limit or remedy water pollution. The focus is on provisions regulating environmental protection in general and water protection in particular within the South African mining sector. The chapter reviews the mining-related laws that are directly and indirectly applicable to water protection. The discussion that follows is structured to serve two primary purposes: It examines (i) the environmental mandate provided in the Constitution; and (ii) how such a constitutional mandate is given effect to and promoted through legislation.

2 Constitutional Mandate for Environmental Protection

The Constitution, as the supreme law in South Africa as a constitutional democracy,[1219] sets the foundation for lawmaking, thus giving obligations to be fulfilled.[1220] As such, the Constitution guides the contents of proposed laws and sets

[1211] Du Plessis (2011) *SAJHR* 306-307.
[1212] Predictions indicate that the effects of the current drought may last for another seven years. See GCIS *South Africa Yearbook 2016/17: Water and Sanitation* (2017) 6; J Benidickson *Environmental Law* 3rd ed (2009) 52-53. As of 2016, South Africa was using approximately 98% of its available fresh water supply. See GCIS "South Africa Yearbook 2015/16: Water and Sanitation" (2016) 448; M Kidd "Poisoning the right to water in South Africa: What can the law do?" (2011) *International Journal of Rural Law and Policy* 1 1-2.
[1213] Du Plessis (2011) *SAJHR* 301.
[1214] Durand (2012) *Journal of African Earth Sciences* 25; Bell et al. (2001) *International Journal of Coal Geology* 196; EA Ripley, RE Redmann & AA Crowder *Environmental Effects of Mining* (1996) 21.
[1215] HL Leff, LR Gordon & JG Ferguson "Cognitive set and environmental awareness" (1974) 6 *Environment and Behavior* 395 400.
[1216] RE Hester & RM Harrison *Mining and Its Environmental Impact* (1994) 135.
[1217] Discussed in Chapter Two. See also McCarthy (2011) 107 *South African Journal of Science* 1.
[1218] See section 4.1 of Chapter Four of this thesis.
[1219] Certification of the Constitution of the Republic of South Africa, 1996 (CCT 23/96) [1996] ZACC 26, para 45.
[1220] S 2 of the Constitution.

minimum standards that proposed laws must meet.[1221] To fulfil a constitutional mandate, legal provisions must be consistent with the Constitution.[1222] A constitutional mandate is described as principles and values to be promoted by state institutions,[1223] as well as a role and responsibility to be assumed by the legislature.[1224]

The Constitution aims to "establish a society based on (…) fundamental human rights".[1225] Such human rights include the right to a safe environment and access to water, for which the Constitution has set a mandate, entrenched in the Bill of Rights.[1226] The entrenched environmental rights are also known as the third generation[1227] or green rights.[1228] That is the right of all to a healthy environment, which requires the protection of the environment.[1229]

The Constitution mandates the state to "respect, protect, promote and fulfil the rights enshrined in the Bill of Rights".[1230] These rights include intra- and inter-generational equity, which requires the environment to be protected for both present and future generations.[1231] The purpose is to ensure that environmental benefits, such as water resources are accessible at all times.[1232]

[1221] Stein (2004) *Tex L. Rev.* 2170; S Woolman & J Swanepoel "Constitutional history" in S Woolman (ed) *Constitutional Law of South Africa* 2nd ed (2013) 2-11.
[1222] H Klug *The Constitution of South Africa: A Contextual Analysis* (2010) 126-127; L Feris "Environmental rights and *locus standi*" in AR Paterson & LJ Kotzé (eds) *Environmental Compliance and Enforcement in South Africa: Legal Perspectives* (2009) 129 132.
[1223] W Freedman *Understanding the Constitution of the Republic of South Africa* (2013) 22-23.
[1224] P Labuschagne "Legislative immobility and judicial activism: The impact on the separation of powers in South Africa" (2013) 38 *Journal for Contemporary History* 126 128; Anonymous "The constitutional mandate: Dynamic and Pro-active legislatures" 2 <http://www.publiclaw.uct.ac.za/usr/public_law/Building/Chapter%201.pdf> (accessed 30-08-2019); M Chaskalson, G Marcus & M Bishop "Constitutional litigation" in S Woolman (ed) *Constitutional Law of South Africa* 2 ed (2013) 3-11.
[1225] Preamble of the Constitution.
[1226] S 24 of the Constitution; Stein (2005) *Tex L. Rev.* 2171-2172.
[1227] First-generation rights are of civil and political nature and the second-generation rights are economic, social, and cultural. See SP Marks "Emerging human rights: a new generation for the 1980s" (1980) 33 *Rutgers L. Rev.* 435 438.
[1228] AJ Steenkamp "The South African Constitution of 1993 and the Bill of Rights: An evaluation in light of international human rights norms" (1995) 17 *Human Rights Quarterly* 101 117; I Currie, J De Waal & Law Society of South Africa *The Bill of Rights Handbook* 6th ed (2013) 517.
[1229] Glazewski *Environmental law in South Africa* 463.
[1230] S 7(2) of the Constitution; R Stein "South Africa's new democratic water legislation: National government's role as public trustee in dam building and management activities" (2000) 18 *JERL* 284 288.
[1231] S 24 (b) of the Constitution.
[1232] K Bakker "The "commons" versus the "commodity": Alter-globalization, anti-privatization and the human right to water in the global south" (2007) 39 *Antipode* 430 431 & 438.

Section 24 of the Constitution requires that, to achieve environmental sustainability,[1233] the constitutional mandate must be implemented and enforced**.** To ensure sustainable water resources for all generations,[1234] these principles must be implemented as follows. First, the state is required to adopt and establish "reasonable legislative and other measures".[1235] Secondly, legislation or measures adopted must seek to address the issues of "pollution and ecological degradation",[1236] by promoting environmental conservation.[1237] Similarly, for the sake of a healthy environment, legislation and other measures adopted by the state must be able to achieve "ecologically sustainable development and use of natural resources".[1238]

The Bill of Rights lists the most important rights for the people of South Africa, which may not be violated, except under circumstances provided in section 36 of the Constitution.[1239] Specifically, the Constitution recognises the need for water for human survival and entrenches the right of access to sufficient water in the Bill of Rights for all who live in South Africa.[1240]

Citizens' right to sufficient water was confirmed in *Mazibuko and Others v City of Johannesburg and Others*.[1241] The issue was whether it was lawful for the City of Johannesburg to make policy and the decision to provide accountholders in the city with a specific amount of free water and have them pay for any extra water used.[1242] The Constitutional Court recognised the duty on the state to provide sufficient water, even though the state has no obligation to provide every person with "sufficient water".[1243]

"State duty" stands out from the above case as an important aspect of the constitutional mandate. In a constitutional democracy such as South Africa, duties

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[1233] As explained under section 2 of Chapter Three of this thesis.
[1234] Currie et al. *The Bill of Rights Handbook* 528
[1235] S 24 (b) of the Constitution.
[1236] S 24 (b) (i).
[1237] S 24 (b) (ii).
[1238] S 24 (b) (iii).
[1239] Currie et al. *The Bill of Rights Handbook* 9
[1240] S 27 (1) (b) of the Constitution; Stein (2000) *JERL* 288; D Brand "The proceduralisation of South African socio-economic rights jurisprudence, or 'What are socio-economic rights for?'" in H Botha, AJ Van der Walt, JC Van der Walt & FI Michelman (eds) *Rights and Democracy in a Transformative Constitution* (2003) 33 40.
[1241] *Mazibuko and Others v City of Johannesburg and Others (CCT 39/09) [2009] ZACC 28*.
[1242] (CCT 39/09) [2009] ZACC 28*,* para 6.
[1243] (CCT 39/09) [2009] ZACC 28*,* para 57.

performed by the state are key to ensuring that citizens' various rights, such as the rights highlighted above, are fulfilled.[1244] "State duty" refers to specific functions to be carried out by the state in the interest of its citizens.[1245] With regard to citizens' interests, state duties involve the promotion of people's or societal wellbeing by ensuring the right to life, health, freedom and property amongst others, as generally provided constitutionally.[1246] Thus, constitutionally, state duty consists of giving effect to the protection of "democratic values, social justice and fundamental human rights".[1247]

In South Africa, state duties are executed by the three arms of the State.[1248] The legislative arm is responsible for enacting laws to guide the pursuit of citizen's interests.[1249] The judiciary's duty is to interpret enacted laws to ensure that different rights and values are well protected.[1250] The executive arm is responsible for policymaking and decision making regarding the implementation and enforcement of enacted laws through administrative action,[1251] explained in Chapter Four of this thesis.[1252]

Regarding administrative action, the Constitution specifically refers to "just administrative action" according to which citizens are entitled to administrative action that is "lawful, reasonable and procedurally fair".[1253] This is necessary to promote water resources management in the mining sector through administrative decision-making which conforms to the law as pointed in *Merafong City Local Municipality v AngloGold Ashanti Limited [2016] ZACC 35*.[1254] It emerged from this case that Merafong City Local Municipality (Merafong) had levied a surcharge on water for

[1244] J de Waal "Constitutional law" in CG Van der Merwe, R Zimmermann & JE Du Plessis (eds) *Introduction to the Law of South Africa* (2004) 55 87.
[1245] C Starck "State duties of protection and fundamental rights" (2000) 3 *PELJ* 1 1.
[1246] Starck (2000) *PELJ* 3; Preamble & S 3(2)(a) of the Constitution.
[1247] Preamble of the Constitution; C Scott & P Macklem "Constitutional ropes of sand or justiciable guarantees? Social rights in a new South African constitution" (1992) 141 *University of Pennsylvania Law Review* 1 33.
[1248] S 40 (1) of the Constitution.
[1249] D Brand "Introduction to socio-economic rights in the South African Constitution" in D Brand & CH Heyns (eds) *Socio-economic Rights in South Africa* (2005) 1 18; S 44(1)(a)(ii) of the Constitution.
[1250] C Hoexter & M Olivier "Introduction" in C Hoexter & M Olivier (eds) *The Judiciary in South Africa* (2014) xxvii; S 165 of the Constitution; Brand "Introduction to socio-economic rights in the South African Constitution" in *Socio-economic Rights in South Africa* 18.
[1251] S 85(2) of the Constitution; Brand "Introduction to socio-economic rights in the South African Constitution" in *Socio-economic Rights in South Africa* 16.
[1252] See section 4.1 of Chapter Four of this thesis.
[1253] S 33(1) of the Constitution.
[1254] *Merafong City Local Municipality v AngloGold Ashanti Limited [2016] ZACC 35.*

industrial use by AngloGold Ashanti Limited (AngloGold).[1255] The Minister of Water Affairs and Forestry (Minister) overturned Merafong's decision,[1256] following AngloGold's appeal[1257] to her.[1258] Merafong ignored the Minister's decision arguing that the Minister intruded on its "exclusive constitutional competence" to manage water systems as provided in section 156(1) of the Constitution.[1259] In its ruling, though the majority judgement among others, granted Merafong leave to appeal the previous rulings, the judgement held that it was unlawful for Merafong to usurpe the role to declare a decision invalid while carrying out its administrative duties.[1260] Thus, constitutionally or legally grounded decisions like the Minister's decision can only be reviewed and set aside by the courts.[1261]

The constitutional provision for just administrative action is elaborated on by the Promotion of Administrative Justice Act (PAJA), which provides detailed guidelines as to how administrative action must be carried out.[1262] PAJA, therefore, seeks to promote accountable and transparent administrative action.[1263] Administrative action guided by good governance principles is necessary to ensure that people's rights such as access to clean water resources are realised.[1264] Realising access to clean water means decisionmakers have to take the necessary actions to promote the protection of water resources in the mining sector through good governance practices.

Based on the above, one duty of the state is to ensure access to water. In that regard, the Constitution mandates the state to make legislation, and take the necessary measures "within its available resources", to ensure that the right to water is "progressively realise[d]".[1265] The Constitution does not specify what quota of available resources must be directed towards the process of ensuring access to water and specifics regarding when it must be realised. Such lack of detail means that the state

[1255] [2016] ZACC 35, para 1.
[1256] In terms of S 8(9) of the Water Services Act (WSA).
[1257] In terms of S 8(4) of the WSA.
[1258] [2016] ZACC 35, paras 1 & 7.
[1259] [2016] ZACC 35, para 2.
[1260] [2016] ZACC 35, para 42.
[1261] [2016] ZACC 35, para 15.
[1262] S 2-5 of PAJA.
[1263] Preamble of PAJA. Accountability and transparency as principles of good governance are explained in section 3.2 of Chapter Five of this thesis.
[1264] S Liebenberg *Socio-economic Rights: Adjudication Under a Transformative Constitution* (2010) 34-35.
[1265] S 27 (2) of the Constitution; Currie et al. *The Bill of Rights Handbook* 572; Liebenberg *Socio-economic Rights:* 197.

must determine what resources and policies are needed to meet the environmental mandate and timeframes within which to achieve that goal, subject to available resources.[1266] In *Government of the Republic of South Africa and Others v Grootboom and Others* the Constitutional Court confirmed the need for the state to progressively realise people's rights.[1267]

Though the State may at times have limited resources to provide clean water resources, it does not rule out the fact that people are entitled to basic water supply for domestic uses such as drinking and sanitation.[1268] Determination by the state, therefore, implies that the successful realisation of the constitutional mandate regarding access to water depends mostly on the state's ability and effectiveness to deliver.

The Constitution contains other provisions with the potential to promote water protection, both directly and indirectly.[1269] For purposes of public administration, the Constitution requires that national legislation ensures that state functions are conducted efficiently and effectively.[1270] To ensure efficiency and effectiveness of environmental decision making,[1271] the Constitution insists that accountability must be a core principle of public administration.[1272] The Constitution also guarantees access to information and mandates that legislation should be made to give effect to that right.[1273] The mandate requires that access to information that may be in possession of the state or another person must be allowed.[1274] The said information may be needed either to give effect to or to protect other rights,[1275] including the right of access to water.[1276] As Chapter Five of this thesis explains,[1277] access to information also has

[1266] Liebenberg *Socio-economic Rights:* 197.
[1267] *Government of the Republic of South Africa and Others v Grootboom and Others (CCT11/00) [2000] ZACC 19,* para 99(2)(a).
[1268] Stein (2004) *Tex L. Rev.* 2168; D Bilchitz *Poverty and Fundamental Rights: The Justification and Enforcement of Socio-economic Rights* (2007) 65.
[1269] Including provisions for environmental governance.
[1270] S 195 (1)(b) of the Constitution; S Pillay "Corruption–the challenge to good governance: A South African perspective" (2004) 17 *IJPSM* 586 588.
[1271] As explained in Chapters Four and Five of this thesis.
[1272] S 195 (1) (f) of the Constitution; Pillay (2004) *IJPSM* 590.
[1273] S 32(2) of the Constitution.
[1274] S 32(1) of the Constitution; Hoexter *Administrative Law in South Africa* 95.
[1275] S 32(b) of the Constitution; Hoexter *Administrative Law in South Africa* 95.
[1276] Stein (2004) *Tex L. Rev.* 2173.
[1277] See section 3.2.1 of Chapter Five of this thesis.

the potential to promote transparency as mandated by the Constitution,[1278] to prevent or control water pollution in the mining sector.

Another constitutional provision that is of great importance in the mining sector is co-operation among state institutions. Co-operative government,[1279] as provided in the Constitution,[1280] must be effectively promoted to guarantee good environmental outcomes.[1281] Chapter Three of the Constitution makes cooperation compulsory between different spheres of government,[1282] as well as between various government departments.[1283] Cooperation as a constitutional mandate entails that different state institutions must cooperate sincerely.[1284] In so doing, state institutions support and consult with one another on "matters of common interest" such as a healthy environment in general and access to clean water in particular.[1285] Cooperative governance has the potential to promote administrative action executed collaboratively when various viewpoint and efforts seek the realisation of a similar goal.[1286]

The discussion above highlights constitutional requirements with the potential to ensure water protection within the mining sector if properly promoted through national legislation. Effective promotion of water resources ensures dignity and equality in terms of access to clean water.[1287] Access to courts is also a means to ensure access to water and thus, dignity and equality. The following discussion focuses on measures within the South African legal framework to promote the above constitutional mandate for the achievement of sustainable water resources. Thus, the sections below discuss the framework created for purposes of *inter alia* people's wellbeing,[1288] environmental

[1278] S 195(g) of the Constitution; A Arko-Cobbah "The right of access to information: Opportunities and challenges for civil society and good governance in South Africa" (2008) 34 *IFLA journal* 180 184.
[1279] As explained in section 3 of Chapter Five.
[1280] Chap 3 of the Constitution.
[1281] N Mirumachi & E Van Wyk "Cooperation at different scales: challenges for local and international water resource governance in South Africa" (2010) 176 *Geographical Journal* 25 27.
[1282] National, provincial and local. See S 40 (1) of the Constitution.
[1283] S 41(1) of the Constitution; Malan (2005) *Politeia* 227.
[1284] S 40 of the Constitution; Malan (2005) *Politeia* 228.
[1285] S 40 of the Constitution; Malan (2005) *Politeia* 227.
[1286] Kotzé "Environmental governance" in *Environmental Compliance and Enforcement in South Africa: Legal Perspectives* 125.
[1287] A Du Plessis "A Government in Deep Water? Some Thoughts on the State's Duties in Relation to Water Arising from South Africa's Bill of Rights" (2010) 19 *Review of European Community & International Environmental Law* 316 322-323.
[1288] S 27 of the Constitution.

rights[1289] and "values and principles governing public administration".[1290] The discussion explicitly refers to water sustainability in the mining sector.

3 Legal Framework Promoting the Constitutional Mandate for Protecting the Environment

Countries such as South Africa that are continuously threatened by the possibility of drought need stronger regulation for better protection of water resources as required by the Constitution.[1291] What follows is an evaluation of provisions within the South African legal framework that provides for the promotion and enforcement of water sustainability in the mining sector.

The law can control the manner in which activities with damaging effects are performed, to counter the adverse impact that activities, such as mining, have on water quality.[1292] South Africa has witnessed the enactment of specific instruments that seek to protect the country's vulnerable water resources.[1293] In that regard, there are several pieces of legislation, which aim to promote and enforce environmental protection. Primarily, there is the National Water Act (NWA),[1294] which targets water protection and management explicitly. The Mineral and Petroleum Development Act (MPRDA)[1295] encourages environmental protection in the context of mining activities. Provisions for such protection are provided for in the National Environmental Management Act (NEMA)[1296] and related acts such as the Protected Areas Act,[1297] the Waste Act,[1298] and the Biodiversity Act.[1299] These pieces of legislation have a common purpose to prevent or mitigate damages to the environment, such as water pollution, and promote waste control and the management of protected areas.[1300] The Protected Areas Act, for instance, provides that no mining activity may be conducted

[1289] S 24.
[1290] S 195.
[1291] S Postel *The Last Oasis: Facing Water Scarcity* (2014) 158 & 181.
[1292] L McAllister *Making Law Matter: Environmental Protection and Legal Institutions in Brazil* (2008) 1-2.
[1293] M De Wit & J Stankiewicz "Changes in surface water supply across Africa with predicted climate change" (2006) 311 *Science* 1917 1918.
[1294] Act 36 of 1998.
[1295] Act 28 of 2002.
[1296] Act 107 of 1998.
[1297] National Environmental Management: Protected Areas (NEMPAA) Act 57 of 2003.
[1298] National Environmental Management: Waste Act 59 of 2008.
[1299] National Environmental Management: Biodiversity Act 10 of 2004.
[1300] Kotzé "Environmental governance" in *Environmental Compliance and Enforcement in South Africa: Legal Perspectives* 111-112.

in a protected environment except with the written permission of the Minister of Environmental Affairs or the Minister of Mineral Resources and Energy.[1301] Similarly, no mining may be conducted in a protected area.[1302] This is a geographical area earmarked and managed to promote and maintain the preservation of nature and the ecosystem services found therein, including water resources.[1303] Thus, allowing mining in a protected area or environment is synonymous to opening the way for environmental degradation because mining is a permanent threat to the environment, thus, a potential cause of water pollution.[1304]

As Chapter One of this thesis highlights, the Minister of Mineral Resources and Energy is the competent authority regarding environmental protection in the mining sector as provided by NEMA.[1305] This arrangement resulted from several engagements between the Department of Mineral Resources and Energy, the Department of Environmental Affairs and the Department of Water and Sanitation,[1306] which gave birth to the "One Environmental System".[1307] The purpose was to regulate all environmental-related aspects of mining through "One Environmental System" provided under NEMA,[1308] to streamline licensing processes for mining, environmental authorisations and water use.[1309]

According to the above arrangement, the Minister of Mineral Resources is the competent authority to issue environmental authorisations and waste management licences as provided by NEMA and related acts.[1310] The Minister of Environmental Affairs, however, is the competent authority to hear appeals on issues relating to environmental authorisation decisions taken by the Minister of Mineral Resources and

[1301] S 48(1)(b) of the NEMPAA.
[1302] S 48(1)(c).
[1303] S 9 of the NEMPAA; IUCN *Guidelines for Applying the IUCN Protected Area Management Categories to Marine Protected Areas* (2012) 9.
[1304] National Research Council, Policy and Global Affairs, Policy Division & Board on Sustainable Development *Our Common Journey: A Transition Toward Sustainability* (1999) 92.
[1305] S 24(1) of NEMA; Appendix 1 (a) & (b) of EIA Regulations Listing Notice 1 of 2014.
[1306] P Mapulane "*One Environmental System" State of Readiness; Mine Closure Financial Provisioning Regulations*" (14-02-2017) *PMG* <https://pmg.org.za/committee-meeting/23936/> (accessed 30-08-2019).
[1307] CER "Mining companies launch their first attacks on the One Environmental System" (17-06-2015) <http://cer.org.za/news/mining-companies-launch-their-first-attacks-on-the-one-environmental-system> (accessed 30-08-2019).
[1308] Thus, repealing existing environmental provisions in the MPRDA.
[1309] T-L Humby (2015) *JERL* 122.
[1310] S 18 (a) of the MPRDA Amendment Act 49 of 2008.

Energy under NEMA.[1311] The impacts of mining on water resources are regulated under the NWA, and the Minister of Water and Sanitation is the competent authority to deal with water use licences.[1312]

The above arrangement aligns with the constitutional mandate regarding cooperative governance.[1313] Intergovernmental cooperation plays a significant role in transforming the "[c]ulture of political engagement around environmental decision making".[1314] Such culture is consistent with the opening paragraph of NEMA, which highlights cooperative governance as key in decision-making processes aiming at environmental protection.

In addition to the abovementioned instruments, the Mining Charter[1315] also seeks to promote the environmental and constitutional mandate.[1316] The Charter provides that five per cent at least of the leviable amount[1317] must be channelled towards "essential skills development".[1318] The five per cent leviable amount is aimed at supporting research and development initiatives in the mining sector.[1319] Such support is aimed at sponsoring initiatives and developments that seek to address water use, as well as environmental protection, amongst others, in the South African mining sector.[1320]

The discussion below focuses primarily on how the MPRDA, NEMA and NWA enable environmental protection. The discussion analyses how water sustainability is promoted through South African statutes and case law. Such promotion is intended to prevent or mitigate issues such as water pollution and to stop and or seek reparation of damages.[1321]

[1311] S 43 (1A) NEMA.
[1312] S 2 & 3 of the NWA.
[1313] Chap 3 of the Constitution.
[1314] Humby (2013) *Revue Générale de Droit* 82; Mostert *Mineral Law:* 66.
[1315] Broad-Based Socio-Economic Empowerment Charter for the Mining and Minerals Industry, 2018.
[1316] S 2.3.1 of the Mining Charter of 2018.
[1317] A leviable amount is "the total amount of remuneration, paid or payable, or deemed to be paid or payable, by an employer to its employees in terms of Schedule 4 of the Income Tax Act ..." See S 3(4) of Skills Development Levies Act 9 of 1999.
[1318] S 2.3 of the Mining Charter of 2018.
[1319] S 2.3.1.
[1320] S 2.3.1.
[1321] J Blignaut & J Van Heerden "The impact of water scarcity on economic development initiatives" (2009) 35 *Water SA* 415 415.

3.1 Measures for the Prevention of Water Pollution

Several provisions in the South African environmental legal framework seek to protect water resources.[1322] Such provisions advance and enforce the constitutional mandate for environment protection by promoting ecologically sustainable development and use of natural resources through the prevention of water pollution.[1323] South Africa's considerable body of jurisprudence on environmental rights, stemming from the Constitutional protection[1324] further supports the development of this area of the law. The judicial system plays a significant role in promoting proper management and sustainable use of the environment and water resources.[1325]

The discussion below deals with how the environmental legal framework provides for water protection in the mining sector through effective administrative action and decision-making processes. The analysis focuses on environmental authorisation processes and how the prevention and mitigation of water pollution, in particular, is addressed before or during the planning phase of a mine's life cycle.

3.1.1 Environmental Authorisation

Due to the adverse effects that mining has on the environment, it is necessary to adopt measures that seek to prevent and or mitigate such effects.[1326] The legal framework in South Africa provides measures such as the requirement for environmental authorisations for planned mining projects as underlined in *Earthlife Africa Johannesburg v Minister of Environmental Affairs and Others*.[1327] In this case the applicant raised concerns about the decision to build a coal-fired power station near Lephalale and contended that the decisionmaker failed to consider the "climate change impacts of the proposed power station before granting authorisation".[1328] Such requirements are specifically directed at applicants of mining rights in South Africa.[1329]

[1322] K Pietersen, T Kanyerere, A Levine, A Matshini & HE Beekman "An analysis of the challenges for groundwater governance during shale gas development in South Africa" (2016) 42 *Water SA* 421 429.
[1323] Pietersen et al. (2016) *Water SA* 426.
[1324] LJ Kotzé "Human rights, the environment, and the global south" in S Alam, S Atapattu, CG Gonzalez & J Razzaque (eds) *International Environmental Law and the Global South* (2015) 171 186-187.
[1325] T Daya-Winterbottom "The legitimate role of rights-based approches to environmental conflict resolution" in C Voigt & Z Makuch (eds) *Courts and the Environment* (2018) 59 77-78.
[1326] See section 4 of Chapter Three of this thesis.
[1327] *Earthlife Africa Johannesburg v Minister of Environmental Affairs and Others (65662/16) [2017] ZAGPPHC 58,* para 2*;* S 24 of NEMA.
[1328] (65662/16) [2017] ZAGPPHC 58, para 1 & 4.
[1329] S 24(1A) of NEMA.

Under NEMA, environmental authorisations are required before commencement of an activity that has the potential to impact the environment adversely, including water resources.[1330] Consequently, no mining operation may proceed if the Minister of Mineral Resources and Energy has not issued an environmental authorisation for the mining project to commence.[1331] For purposes of prospecting and mining activities, no exemption from such requirement can be obtained, because mining and prospecting are listed activities that always require approval in the form of the environmental authorisation.[1332] This point was illustrated in *Mining and Environmental Justice Community Network of South Africa and Others v Minister of Environmental Affairs and Others* when the Court ruled that in terms of NEMPAA, mining in a protected area without proper consideration of its environmental impact was unacceptable.[1333]

Listed activities in the context of mining are identified by the Minister of Environmental Affairs under NEMA[1334] as activities that cannot start without the requisite environmental authorisations having been issued for that purpose.[1335] In *Joint Owner of Remainder ERF 5216 Hartenbos v MEC of Local Government and Others,* the Court reiterated that an environmental authorisation as a requisite for listed activities must not be neglected.[1336] Mining operations cannot begin without environmental authorisations because mining is by nature a constant threat to the environment; thus, a potential cause of water pollution.[1337] In this vein, it was held in *Uzani Environmental Advocacy CC v BP Southern Africa* that commencing a listed activity without the required authorisation is a breach of requirements relating to listed activities.[1338] The ruling was made despite the fact that the accused had already submitted an application for rectification under section 24G of NEMA and had been imposed an administrative fine.[1339] The trial therefore, merely sought to make a point that rectifying

[1330] S 24(1).
[1331] Specifically if the Minister of Environmental Affairs deems that there is no foreseen threat to environment sustainability. See S 24M of NEMA.
[1332] Activity 20 & 21, Appendix 1 of EIA Regulations Listing Notice 1 of 2014.
[1333] *Mining and Environmental Justice Community Network of South Africa and Others v Minister of Environmental Affairs and Others (50779/2017) [2018] ZAGPPHC 807,* para 4.11.3.
[1334] S 24(2) of NEMA.
[1335] S 1 of EIA Regulations Listing Notice 1 of 2014.
[1336] *Joint Owner of Remainder ERF 5216 Hartenbos v MEC of Local Government, Environmental Affairs and Development Planning, Western Cape Province and Another (23635/2009) [2010] ZAWCHC 197,* paras 38 & 50.
[1337] See section 3 of Chapter two of this thesis.
[1338] *Uzani Environmental Advocacy CC v BP Southern Africa (Pty) Ltd (CC82/2017) [2019] ZAGPPHC 86,* paras 117 & 130.
[1339] (CC82/2017) [2019] ZAGPPHC 86, para 129.

an environmental crime and paying a penalty does not exclude the fact that a crime had been committed and the perpetrator deserved to be prosecuted.[1340]

Like prospecting and mining, the decommissioning of an activity that requires a closure certificate as provided by the MPRDA is classified as a listed activity and, therefore, requires an environmental authorisation.[1341] This is the same for instances where a "prospecting right, mining right, mining permit, production right or exploration right" is required,[1342] specifically, if the activity's output has decreased by 90 per cent or more within five years.[1343] These are listed because even at this stage, mining remains a potential hazard to the environment.[1344]

The effectiveness of environmental authorisations depends on three processes, which provide measures to achieve the prevention or mitigation of environmental degradation in general in the mining sector.[1345] The processes include the Scoping Report, Environmental Impact Assessment and the Environmental Management Programme.

3.1.1.1 Scoping Report

A scoping report is to be prepared and submitted by the applicant to the competent authority prior to the Environmental Impact Assessment (EIA) process.[1346] The primary purpose for scoping is to limit the extent of an EIA that an applicant for environmental authorisation intends to carry out.[1347] A scoping report is required to provide details about a proposed activity, including the possible and practical alternatives, which are likely to have fewer impacts on the environment.[1348] The scoping report must also include a description of laws, policies and documents,[1349] in the context of which the proposed activity is considered.[1350] The said report must also highlight anticipated environmental issues and their probable impacts, including already anticipated

[1340] (CC82/2017) [2019] ZAGPPHC 86, para 69.
[1341] Activity 22, Appendix 1 of EIA Regulations Listing Notice 1 of 2014.
[1342] Activity 22.
[1343] Activity 22.
[1344] Humby (2015) *JERL* 124.
[1345] W Du Plessis "Legal mechanisms for cooperative governance in South Africa: successes and failures" (2008) 23 *SA Public Law* 87 96.
[1346] Regulation 21 of EIA Regulations, 2014.
[1347] DEAT *General Guide to the Environmental Impact Assessment Regulations, 2006* (2006) 10.
[1348] Point 1, Appendix 2 of the EIA Regulations, 2014.
[1349] These documents are plans, guidelines, spatial tools, municipal development planning frameworks and instruments. See Point 1(e), Appendix 2 of the EIA Regulations, 2014.
[1350] Point 1(e), Appendix 2 of the EIA Regulations of 2014.

impacts.[1351] Moreover, the scoping report must highlight how the EIA will be conducted. It includes outlining how the potential impacts will be assessed as well as the "required specialists or specialist reports".[1352]

The report must demonstrate that a public participation process has taken place for a period of not less than thirty days, to promote effective decision-making.[1353] Consultation with communities to give effect to provisions regarding public participation is important as pointed in *State v Blue Platinum Ventures (Pty) Ltd and Matome Samuel Maponya.*[1354] In that regard a public participation process must ensure that all interested and affected parties, as well as stakeholders, are given a "[r]easonable opportunity to participate".[1355] Details of the public participation process, including its aim and outcomes such as comments must be included in the scoping report.[1356]

As highlighted in the *Bengwenyama Minerals* case,[1357] it is necessary to respond to people's needs by encouraging them to participate in policymaking.[1358] This implies that administrative action would be fair to communities if public participation processes are conducted in good faith.[1359] The ruling in *Director: Mineral Development, Gauteng Region and Another v Save the Vaal Environment and Others*[1360] also supported the legal requirement for public participation.[1361] The Court in its ruling indicated that administrative processes should accord proper consideration to environmental issues and how they affect people's lives.[1362] This stance supports the fact that a safe environment is achievable if environmental rights are acknowledged as fundamental

[1351] Point 1(d).
[1352] Point 1(f).
[1353] Regulation 21(1) of the EIA Regulations of 2014.
[1354] *S v Blue Platinum Ventures (Pty) Ltd and other, Lenyenye Regional Magistrate Court (RN126/2013) [2004]),* unreported.
[1355] S 24(4)(v) of NEMA; Regulation 39(1) of the EIA Regulations, 2014; (65662/16) [2017] ZAGPPHC 58, para 3.
[1356] Regulation 21(1) of the EIA Regulations of 2014.
[1357] *Bengwenyama Minerals (Pty) Ltd and Others v Genorah Resources (Pty) Ltd and Others (CCT 39/10) [2010] ZACC 26.*
[1358] (CCT 39/10) [2010] ZACC 26, para 66.
[1359] T-L Humby "The Bengwenyama Trilogy: Constitutional Rights and the Fight for Prospecting in Community Land" (2012) 15 *PELJ* 165 182.
[1360] The main issue was whether an unincorporated association group of landowners could raise concerns while an environmental authorisation was still pending. (133/98) [1999] ZASCA 9, para 1.
[1361] (133/98) [1999] ZASCA 9, para 20.
[1362] (133/98) [1999] ZASCA 9, para 20.

and justiciable human rights,[1363] including people's right to be heard, especially when something as important as a safe environment is concerned.[1364]

Public participation also plays an important role in promoting transparency, which is one of the essential elements that the competent authority has to consider during decision making relating to approval of environmental authorisations.[1365] By being transparent, an environmental authorisation process is consistent with PAIA which seeks to promote people's right to have access to existing information,[1366] as required constitutionally.[1367] In so doing, PAIA gives effect to the constitutional "right of access to any information" which may be in the possession of the state or another person.[1368] The said information may be needed either to give effect to other rights or to protect the latter.[1369]

In terms of the Act, a request for access must be granted to information held by a public body for the exercise of its mandate,[1370] except where such access would be inconsistent with the provisions regarding the grounds on which access to information may be refused.[1371] Hence, access to information must only be refused for reasons provided under Chapter 4 of PAIA. However, access to certain information protected under Chapter 4 of PAIA may be granted if it is in public interest,[1372] including environmental risk.[1373]

Upon receipt of the scoping report, the competent authority has forty-three days to accept the report for the applicant to proceed with the EIA if the report is deemed consistent and complete.[1374] The competent authority may reject the scoping report if the proposed project falls under activities prohibited by the law or the scope fails to

[1363] L Verdonck "Human Rights in an Age of Economic Globalisation-The Case of the Mogalakwena Mine, South Africa" (2015) 9 *Hum. Rts. & Int'l Legal Discourse* 34 38-39.
[1364] (133/98) [1999] ZASCA 9, para 20.
[1365] See section 3.2.2 of Chapter Five of this thesis.
[1366] Preamble to PAIA; Doj & cd "The Promotion of Access to Information Act, 2000 (Act 2 of 2000)" (17-08-2016) <http://www.justice.gov.za/paia/paia-faq.htm#sthash.1Za1kYak.dpuf> (accessed 30-08-2019).
[1367] S 32 of the Constitution.
[1368] S 32(1).
[1369] S 32(1)(b); S 9 of PAIA.
[1370] S 8(2) of PAIA.
[1371] Ch 3 & 4 .
[1372] S 46.
[1373] S 46(a)(ii).
[1374] Regulation 22(a) of the EIA Regulations of 2014.

substantially cover the provisions of appendix two to the EIA Regulations.[1375] Once the scoping report is approved, the next phase of the environmental authorisation is to conduct an EIA.

3.1.1.2 Environmental Impact Assessment

Following the acceptance of the scoping report, the applicant has 160 days to conduct an EIA and submit a report thereof.[1376] Legislation regarding EIAs[1377] plays a vital role in the promotion of water sustainability in South Africa.[1378] The MPRDA, as the principal legislation regulating mineral resources in South Africa, highlights the importance of environmental protection.[1379] The Minister responsible for mineral resources should grant a prospecting right only if there is assurance that prospecting will not result in uncontrollable levels of pollution.[1380] Similarly, it is a prerequisite of the MPRDA's regulations that all mining-related activities require an EIA,[1381] as provided for in NEMA. NEMA provides that an applicant for an environmental authorisation must conduct a comprehensive EIA,[1382] before performing any activity that has the potential to cause degradation in the environment, including water pollution if the EIA is approved.[1383]

An EIA can be defined as a process by which future environmental impacts of a planned activity or development project are evaluated and communicated,[1384] including water pollution.[1385] The EIA process occurs before a decision is made by the Minister of Mineral Resources and Energy at the planning and design stage of the proposed project. The decision relies on the EIA to prevent the adverse impacts of

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[1375] Regulation 22(b).
[1376] Regulation 23(a) of the EIA Regulations of 2014.
[1377] Introduced in the United States of America over thirty years ago, see M Kidd & F Retief "Environmental assessment" in HA Strydom & ND King (eds) *Environmental Management in South Africa* 2nd ed (2009) 971 971.
[1378] Kidd & Retief "Environmental assessment" in *Environmental Management in South Africa* 971; S Momtaz & Z Kabir *Evaluating Environmental and Social Impact Assessment in Developing Countries* (2013) 165.
[1379] S 5A(a) of the MPRDA.
[1380] S 17(1)(c).
[1381] S 86 GNR.527 of 23 April 2004.
[1382] S 24(1) of NEMA.
[1383] S 24. EIAs were provided under the MPRDA prior to the 2014 amendment of NEMA. See sec 39 (1) of MPRDA.
[1384] RE Munn *(ed) Environmental Impact Assessment: Principles and Procedures* 2nd ed (1979) 9; S Jay, C Jones, P Slinn & C Wood "Environmental impact assessment: Retrospect and prospect" (2007) 27 *Environmental Impact Assessment Review* 287 288.
[1385] Momtaz & Kabir *Evaluating Environmental and Social Impact Assessment* 89.

mining activities such as water pollution or mitigate them as much as possible.[1386] The process also considers the socio-economic impacts of such projects on people's wellbeing.[1387] Thus, an EIA is supposed to anticipate and highlight the consequences of planned projects.[1388]

In the mining sector, an EIA aids in the design of measures to counter mining's adverse environmental impacts.[1389] The EIA provides decisionmakers with information and recommendations that may help with better protection in the area where a project is planned to take place.[1390] An EIA is, therefore, very helpful regarding informed decision making which has the potential to improve accountability in an administrative action relating to water protection in the mining sector.[1391]

Following on the requirement for EIAs highlighted by the MPRDA, NEMA seeks to ensure environmental sustainability by providing guidelines for EIAs for purposes of decision making concerning environmental sustainability. Successful EIAs ostensibly serve the objective of NEMA in the pursuit of sustainable development, which translates into a sustainable environment.[1392] A sustainable environment requires, for instance, the conducting of EIAs to prevent or limit actions that may lead to water pollution.[1393]

Therefore, EIAs must be undertaken to highlight the potential risks that planned activities can have on the environment, including water resources.[1394] Planned activities requiring EIAs are specifically those classified as listed activities,[1395] including activities that require prospecting rights,[1396] as provided for in the

[1386] P Wathern "An introductory guide to EIA" in P Wathern (ed) *Environmental Impact Assessment: Theory and Practice* (1988) 1 21.
[1387] A Boer, L Fritschi & S O'Beirne "Human health in environmental assessment and management" in HA Strydom & ND King (eds) *Environmental Management in South Africa* (2009) 810 810; Wathern "An introductory guide to EIA" in *Environmental Impact Assessment: Theory and Practice* 21.
[1388] RK Morgan "Environmental impact assessment: The state of the art" (2012) 30 *Impact Assessment and Project Appraisal* 5 6-7.
[1389] A Krzemień, AS Sánchez, PR Fernández, K Zimmermann & FG Coto "Towards sustainability in underground coal mine closure contexts: A methodology proposal for environmental risk management" (2016) 139 *Journal of Cleaner Production* 1044 1045.
[1390] Krzemień et al. (2016) *Journal of Cleaner Production* 1046.
[1391] Leonard & Lebogang (2018) *Sustainable Development* 211-212.
[1392] S 2(3) of NEMA.
[1393] S 2(3)(a)(ii).
[1394] S 24 (4) & (5)(iii).
[1395] See section 3.1.1 of this chapter
[1396] Activity 20, Appendix 1 of EIA Regulations Listing Notice 1 of 2014.

MPRDA.[1397] Activities requiring mining permits under the MPRDA are also classified as listed activities.[1398]

The primary purpose of an EIA report is to demonstrate that the applicant of an environmental authorisation has seriously considered the environmental impacts of a planned mining project, how such impacts will be mitigated and outcomes that may occur upon closure.[1399] Thus, the report must highlight how the planned activity complies with existing policies and laws.[1400] It is also necessary to identify the area where the project will take place, as indicated in the scoping report while highlighting the importance of the project.[1401] Identifying the project area helps the decisionmakers to establish whether it is feasible to authorise any mining project in the area.[1402]

The EIA report must also determine the likely impacts that may occur,[1403] and identify possible or suitable measures to mitigate,[1404] or the extent to which reparation is probable.[1405] These steps help to ensure that a project does not cause harm like water pollution that may neither be repaired nor controlled.[1406] A comprehensive EIA report is very likely to help the competent authority to carry out effective decision making when deciding on an environmental authorisation application.[1407] The report is acceptable when consultation with various stakeholders has taken place,[1408] thus promoting participation and transparency that are essential for effective accountability.[1409] As explained below, an environmental management programme may be required besides the EIA report for the approval of an environmental authorisation.

[1397] S 16 of the MPRDA.
[1398] Activity 21, Appendix 1 of EIA Regulations Listing Notice 1 of 2014.
[1399] Point 1(2), Appendix 3 of the EIA Regulations of 2014.
[1400] Point 2(a).
[1401] Point 2(b).
[1402] Dudka & Adriano (1997) *Journal of Environmental Quality* 599.
[1403] Point 2(d), Appendix 3 of the EIA Regulations of 2014.
[1404] Point 2(g) & (h).
[1405] Point 2(d)(aa), Appendix 3 of the EIA Regulations of 2014.
[1406] R Therivel *Strategic Environmental Assessment in Action* (2013) 78.
[1407] LA Sandham & HM Pretorius "A review of EIA report quality in the North West province of South Africa" (2008) 28 *EIA Review* 229 229 & 238.
[1408] Point 2 Appendix 3 of the EIA Regulations of 2014.
[1409] As discussed in Chapter Five of this thesis.

3.1.1.3 Environmental Management Programme

Where an EIA is required before a decision can be made regarding an application for environmental authorisation, the competent authority may request an Environmental Management Programme Report (EMPr).[1410] An EMPr provides details on proposed measures to protect the environment, manage, mitigate or repair the environmental impacts[1411] identified in the EIA report.[1412] Such information must include information on the expert(s)[1413] who prepared the EMPr.[1414] An EMPr must also identify the impacts and risks of a planned project that "need to be avoided, managed and mitigated"[1415] throughout the development phases.[1416] In addition, the EMPr must explain how such effects will be managed,[1417] implemented and monitored.[1418] Similarly, time frames within which the impact management will be implemented,[1419] and the persons responsible for the monitoring of such management must be indicated.[1420]

Once the EIA and an EMPr have been submitted, the Minister of Mineral Resources and Energy must then consider the environmental authorisation.[1421] The above processes have the potential to ensure that the impacts of mining are mitigated or prevented where possible by decisionmakers.[1422] The following discussion highlights some measures to promote decision-making processes relating to the prevention or mitigation of environmental degradation, thus, water pollution.

3.1.2 Environmental Implementation and Environmental Management Plans

While environmental authorisation processes mainly involve mining companies, the implementation and enforcement of environmental protection measures like environmental implementation and management plans are the responsibility of

[1410] S 24N (1A) of NEMA.
[1411] S 24N (2)(a).
[1412] S 24N (2)(a).
[1413] Environmental Assessment Practitioner.
[1414] Point 1(1)(a)(ii), Appendix 4 of the EIA Regulations of 2014.
[1415] Identified through the EIA.
[1416] Point 1(d), Appendix 4 of the EIA Regulations of 2014.
[1417] Point 1(g).
[1418] Point 1(h).
[1419] Point 1(j).
[1420] Point 1(i).
[1421] R Alberts, JA Wessels, A Morrison-Saunders, MP McHenry, AR Sequeira, H Mtegha & D Doepel "Complexities with extractive industries regulation on the African continent: What has 'best practice'legislation delivered in South Africa?" (2017) 4 *The Extractive Industries and Society* 267 273.
[1422] Alberts et al. (2017) *The Extractive Industries and Society* 269 & 271.

government. The environmental protection measures are realised through administrative action by decisionmakers, who are government officials.[1423] This section, therefore, focuses on the crucial role of government to ensure that plans relating to environmental protection are implemented effectively. Water resources can only be managed properly in the mining sector if all relevant decisionmakers have a common understanding of what is at stake.[1424] It is, therefore, not enough to impose obligations on right holders to protect water resources during their mining activities.

Some measures to be carried out by decisionmakers to protect water resources involve the requirement to develop Environmental Implementation Plans and Environmental Management Plans.[1425] Both Plans are specifically meant to align the various policies, plans or programmes adopted by national government departments in their pursuit of environmental sustainability.[1426] Similarly, those Plans seek to protect the environment against detrimental activities[1427] through cooperative governance.[1428] An Environmental Implementation Plan must indicate "[p]olicies, plans and programmes" likely to influence environmental protection,[1429] as well as how compliance will be ensured.[1430] An Environmental Management Plan must also contain a specific description of measures for cooperative governance.[1431]

In the context of the requirement of cooperative governance, coordination and harmonisation of policies and programmes amongst others are necessary in decision-making processes,[1432] especially by government departments responsible for promoting environmental sustainability.[1433] Such cooperation is needed in the South African mining sector where environmental protection is a matter of concern to more

[1423] W Du Plessis "Environmental Compliance and Enforcement in South Africa: Legal Perspectives" in AR Paterson & LJ Kotzé (eds) *Environmental Compliance and Enforcement in South Africa: Legal Perspectives* (2009) 197 200.
[1424] See section 4.3 of Chapter Four of this thesis.
[1425] S 11 of NEMA.
[1426] S 12(a). The policies, plans and programs set out measures by the government to pursue environmental sustainability in the mining sector. See Du Plessis "Environmental Compliance and Enforcement in South Africa: Legal Perspectives" in *Environmental Compliance and Enforcement in South Africa: Legal Perspectives* 200.
[1427] S 12(c) - (d) of NEMA.
[1428] S 12(b).
[1429] S 13(a).
[1430] S 13(b) & (c).
[1431] S 14(f).
[1432] Du Plessis (2008) *SA Public Law* 93; S 2(4)(l) of NEMA.
[1433] S 12(a) NEMA.

than one Department.[1434] Under Schedule 1 and 2 of NEMA, the Department of Mineral Resources and Energy, Department of Environmental, Forestry and Fisheries, and the Department of Water and Sanitation all fall within the category of government departments required to prepare Environmental Implementation and Management Plans.[1435] The core purpose of Environmental Implementation and Management Plans is probably one of the motivations behind the negotiation that led to the establishment of the One Environmental System (OES).[1436]

The OES seeks to ensure set time-frames for the consideration and issuing of mining permits, water use licences and environmental authorisations.[1437] The goal is to synchronise the issuing processes of such permits, licences and authorisations to ensure that policies and programmes of different government departments are pursued in a coordinated manner.[1438] Coordinated policies and programmes in the mining sector have the potential, if implemented properly, to result in effective and efficient control or mitigation of water pollution.[1439]

Based on the above discussion, decision-making processes are likely to be more effective when policies and programmes are adopted through Environmental Implementation and Management Plans to foster environmental protection. Environmental plans identify set targets such as the control of water pollution and measures to achieve such targets.[1440] These offer guidance for decision-making processes and ensure that problems such as water pollution can be averted, or at least mitigated.[1441] The following section highlights how water pollution can be prevented or mitigated in the mining sector through legal provisions specifically designed for that purpose.

[1434] S 11(1) & (2).
[1435] Schedule 1 & 2 of NEMA.
[1436] Humby (2015) *JERL* 113 & 128.
[1437] See section 3 of this chapter.
[1438] S Mpinga "The One Environmental System for the mining industry: Has it given rise to intra-governmental conflict of interest?"; Humby (2015) *JERL* 128.
[1439] RM Saleth & A Dinar "Institutional changes in global water sector: trends, patterns, and implications" (2000) 2 *Water Policy* 175 183; N Zwane, D Love, Z Hoko & D Shoko "Managing the impact of gold panning activities within the context of integrated water resources management planning in the Lower Manyame Sub-Catchment, Zambezi Basin, Zimbabwe" (2006) 31 *Physics and Chemistry of the Earth, Parts A/B/C* 848 849.
[1440] DEAT *Environmental Management Plans, Integrated Environmental Management* (2004) *Information Series* 12 5 & 7.
[1441] (133/98) [1999] ZASCA 9, para 6 & 20.

3.1.3 Prevention of Water Pollution under Water Specific Provisions

The management of water resources and control of pollution is regulated by the NWA.[1442] As highlighted above, issues relating to the control of water pollution have to be assessed and included in EIAs, EMPrs or environmental management plans relating to prospecting and mining.[1443] A primary objective of the NWA is to ensure that scarce water resources are handled in ways that meet "basic human needs of present and future generations".[1444] Within the mining context, the NWA seeks to promote water sustainability[1445] and ensure equitable access thereto.[1446] It does so by protecting water sources and associated ecosystems and thus preventing pollution and related degradation of water resources.[1447] The NWA, therefore, seeks to minimise the risk of having unhealthy or contaminated water resources.[1448]

As a trustee of all water resources on behalf of the national government, the Minister of Water and Sanitation is responsible for the management and equitable allocation of South Africa's "scarce and unevenly distributed water resources".[1449] The primary goal of management and equitable allocation of water is to ensure the sustainable use of water resources that promote the protection and provision of quality water resources.[1450] The Minister, therefore, has the responsibility to take actions that ensure that water resources in the mining sector are not used in ways that may result in water pollution

In terms of the OES, the Department of Water Sanitation (DWS) recognises the role of the Department of Mineral Resources as the competent authority to promote "[e]nvironmental management within the mining industry".[1451] The DWS also acknowledges the role of the Department of Environmental Affairs as the lead Department regarding the promotion of environmental protection.[1452]

[1442] Part 4 of the NWA.
[1443] See section 3.1.1.2 to 3.1.2 of this chapter.
[1444] S 2(a) of the NWA.
[1445] S 2.
[1446] S 2(h).
[1447] S 26.
[1448] Schreiner (2013) *Water Alternatives* 240.
[1449] Preamble & S 3(1) of the NWA.
[1450] P Van der Zaag "Asymmetry and equity in water resources management; critical institutional issues for Southern Africa" (2007) 21 *Water Resources Management* 1993 1995-1996; Preamble of NWA.
[1451] Explanatory note to Regulations on use of Water for Mining and Related Activities Aimed at the Protection of Water Resources (hereinafter Explanatory note).
[1452] Explanatory note.

Nonetheless, the prevention and mitigation of water pollution in the South African mining industry is still a primary matter of concern to the DWS. Two key aspects arising from the legal framework are worth highlighting. First, the requirement to inform or notify the DWS of any proposed mine project,[1453] at least fourteen days before the commencement of an intended mine-related activity,[1454] or resumption of any such activity.[1455]

Secondly, restrictions in terms of the prevention of water pollution must be observed. To ensure prevention, no mine-related structure or deposit is allowed in an area that is prone to flooding or near a watercourse.[1456] This helps to avoid the pollution of clean water resources. Similarly, during mining or related activities, no one may use a substance that has the potential to pollute a water resource.[1457] Therefore, any person intending to embark on a mining project or responsible for one must include measures to prevent contamination of water resources as part of the design of the mine.[1458] Prevention in this context requires that any such person must take the necessary measures to ensure water pollution caused by that person's activities does not contaminate other clean water resources.[1459] Such a goal can be achieved by preventing seepage or flow of polluted water in clean water sources, or minimising the "[f]low of any surface water or floodwater" into active mine sites.[1460]

Though it is necessary to prevent water pollution, it must be acknowledged that such prevention is not always easily achieved.[1461] Thus, there must be rules to remedy the situation when it does occur. The following discussion highlights legal provisions on how water pollution can be managed.

3.2 Remedying Water Pollution through the Law

Because it is not always possible to avoid environmental degradation due to the very nature of mining, water pollution is very likely to occur. For instance, most waste

[1453] S 2 of Regulations on use of Water for Mining and Related Activities Aimed at the Protection of Water Resources, GN704 of 1999.
[1454] S 2(1).
[1455] S 2(2)(b).
[1456] S 4.
[1457] S 5 .
[1458] S 6.
[1459] S 7(a).
[1460] S 7(c).
[1461] As highlighted in section 2 of Chapter Two of this thesis.

produced during mining operations ends up as water-polluting agents.[1462] It is a fact that mining is one of the main contributors to the deterioration of water quality in South Africa.[1463] AMD from old and abandoned mines, in particular, has been identified as one major impact of mining on water quality in parts of the country.[1464] Various water sources, such as rivers, are heavily contaminated due to abandoned mine works in or around river catchment, as highlighted in Chapter Two.[1465] Consequently, it is often established that water quality is low in pH and the concentration level of dissolved metals such as aluminium, manganese, iron and zinc is high.[1466]

It is paramount to establish measures that can assist and urge actions in making responsible and effective decisions towards the management and control of water pollution in the mining sector. Therefore, besides aiming to prevent water pollution, laws and policies must make provision for the restoration, remedying and rehabilitation of the impacts of mining on water resources. The discussion that follows addresses how pollution management and control are regulated during the operation and closure phases of mining.

3.2.1 Promotion of Water Pollution Control during the Operational Phase of mining

It is important to redress water pollution while carrying on with mining operations. Before the issuing of environmental authorisations,[1467] applicants must provide security in the form of ring-fenced funds, to repair damage to the environment if and when they occur.[1468] Such funds can be used by the Minister of Mineral Resources and Energy to repair the negative impacts of mining, should the mining company fail to comply with the requirements provided in the environmental authorisation.[1469]

Failure by mining companies to comply with the law can result in the responsible director being held liable for a fine of up to five million rands or a jail term of up to 10

[1462] Ranchod et al. (2015) *Water SA* 291.
[1463] L Claassens, S Dahms, JHJ Van Vuren & R Greenfield "Artificial mussels as indicators of metal pollution in freshwater systems: A field evaluation in the Koekemoer Spruit, South Africa" (2016) 60 *Ecological Indicators* 940 940.
[1464] Dabrowski et al. (2015) *River Research and Applications* 1357-1358.
[1465] 1354.
[1466] 1354.
[1467] As discussed under section 3.1.1 of this chapter.
[1468] S 24(5)(d) of NEMA.
[1469] S 24P(1) & (2).

years.[1470] The defaulting person can be liable for both penalties,[1471] as was demonstrated in *State v Blue Platinum Ventures (Pty) Ltd and Matome Samuel Maponya*.[1472] The director of Blue Platinum Ventures (Pty) Ltd pleaded guilty for failing to comply with environmental provisions applicable to the mining sector.[1473] The Court handed him a five-year suspended sentence, on condition that the damage to the environment is rehabilitated and that similar damage was not to be caused during the suspension period.[1474]

This ruling has been described as a "landmark ruling" because, for the first time in South Africa, a managing director of a company had been personally held liable for a mining-related environmental crime.[1475] This judgment was an important step toward ensuring that environmental mandates are pursued by enforcing environmental legislation.[1476] The ruling, therefore, demonstrates that the state can achieve positive outcomes when necessary actions are taken to sue for environmental damage in the mining sector. The ruling does so by holding responsible an author of environmental violation for causing devastating effects to the environment.[1477]

Similarly, where a mining project has caused water pollution, and urgent attention is required to avert subsequent pollution of water sources, the person responsible for the incident is required to remedy such pollution.[1478] In *Minister of Water Affairs and Forestry v Stilfontein Gold Mining Company Ltd and Others*,[1479] the respondents were

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[1470] Ss 31L & 31N(3).
[1471] S 31N(3).
[1472] The director's company had illegally mined beyond the authorised area, leading to widespread environmental destruction and failed to rehabilitate the land. *S v Blue Platinum Ventures (Pty) Ltd and other*, *Lenyenye Regional Magistrate Court (RN126/2013) [2004],* unreported. See also T-L Humby "*S v Blue Platinum Ventures 16 (Pty) Ltd & Matome Samuel Maponya,' Case Note* https://cer.org.za/virtual-library/judgments/magcourt/s-v-blue-platinum-ventures-16-pty-ltd-and-others, (accessed 17-02-18).
[1473] (RN126/2013) [2004], unreported.
[1474] (RN126/2013) [2004], unreported.
[1475] Henning & Hauman "Corporate criminal responsibility: A South African perspective" in *Research Handbook on International Financial Crime* 203-204; J Truter "Environmental law compliance – the noose is tightening" (03-06-2014) <https://www.werksmans.com/legal-briefs-view/environmental-law-compliance-noose-tightening/> (accessed 30-08-2019).
[1476] Henning & Hauman "Corporate criminal responsibility: A South African perspective" in *Research Handbook on International Financial Crime* 204.
[1477] (RN126/2013) [2004], unreported; Henning & Hauman "Corporate criminal responsibility: A South African perspective" in *Research Handbook on International Financial Crime* 204.
[1478] S 20(4)(a) & (c) of NWA.
[1479] The respondents tried to escape responsibility by not pumping water as instructed and resigned en masse. *Minister of Water Affairs and Forestry v Stilfontein Gold Mining Company Limited and Others (7655/05, 7655/05) [2006] ZAGPHC 47*, para 16.

held in contempt of court for violating a court order that required them to comply with the provisions of directives issued pursuant to section 19 of the NWA.[1480] The said directives required the respondents to pump water from underground to the surface on a daily basis to prevent the pollution of freshwater resources.[1481] For failing to do so they were fined R15 000 each, failing which, they each faced a prison term of six months.[1482]

The relevant persons must be held responsible,[1483] to ensure that they repair the consequences of their acts on water resources, as required by the polluter-pays principle.[1484] This principle requires anyone responsible for environmental pollution to take reasonable measures to prevent the pollution or to limit and repair any such pollution as much as possible, especially within the confines of the law.[1485]

Apart from provisions compelling persons responsible for environmental degradation to repair the damage as demonstrated in the case above, there is an alternative. The agency responsible for the management of a catchment area where pollution has occurred may remedy such pollution at the expense of the person who caused the pollution.[1486] This may result from instances where a person responsible for water pollution is unable to comply with directives to remedy such pollution. The inability could, for instance, be due to lack of expertise, means or will to accomplish such a task.[1487]

To control water pollution and protect limited freshwater resources, it is important that persons involved in mining projects take the necessary steps to ensure that water used in mining operations is processed in such a way that it can serve other purposes.

[1480] S 18 of NWA deals with the "prevention and remedying effects of pollution".
[1481] (7655/05, 7655/05) [2006] ZAGPHC 47, para 2.
[1482] (7655/05, 7655/05) [2006] ZAGPHC 47, para 22.
[1483] S 28(1) of NEMA; S 14(1) of Regulations on use of Water for Mining and Related Activities Aimed at the Protection of Water Resources.
[1484] OECD *The Polluter-Pays Principle: OECD Analysis and Recommendations* (1992) *Annex* <http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=OCDE/GD(92)81&docLanguage=En> (accessed 14-11-2019); SE Gaines "The polluter-pays principle: From economic equity to environmental ethos" (1991) 26 *Tex. Int'l LJ* 463 466; S Ambec & L Ehlers "Regulation via the Polluter-pays Principle" (2016) 126 *The Economic Journal* 884 885; S 2(4)(p) of NEMA.
[1485] Gaines (1991) *Tex. Int'l LJ* 466; S 2(4)(p) of NEMA.
[1486] S 20(6)(a), (b)(iii) & S 7 of NWA.
[1487] G Hilson "Barriers to implementing cleaner technologies and cleaner production (CP) practices in the mining industry: a case study of the Americas" (2000) 13 *Minerals Engineering* 699 704 & 709; (7655/05, 7655/05) [2006] ZAGPHC 47, paras 15.1 & 16.9.

The processing includes recycling water[1488] for human use or irrigation. Installations and dams for water recycling must be designed to prevent "[s]pillage, seepage or release" of contaminated waters to avoid further pollution of the natural environment facilities.[1489]

The discussion in this section shows that the legal framework provides for the control of water pollution at the operational phase of mining. Incidences of water pollution are, however, also common beyond the operational phase of mining. The discussion that follows highlights provisions aiming at mine closure and rehabilitation.

3.2.2 Management of Water Pollution through Mine Closure and Rehabilitation

Mine closure is a mining phase, essential for environmental protection.[1490] Effective mine closure helps to eliminate possibilities of further water pollution at the same site. The main concern at this stage of the project life cycle is the rehabilitation of any contaminated underground and surface water resources.[1491]

The term "mine closure", as explained in Chapter Two of this thesis covers a wide array of driving factors, processes and outcomes.[1492] Mine closure refers to the point in a mine's life where its operational phase is about to cease or has ended, to give way for the mine rehabilitation phase.[1493] In essence, the goal of mine closure is mine completion, that is, putting an end to a mine's operational phase. The said closure may be permanent or temporary.[1494] In the instance of temporary closure, such closure may lead to a programme of care and maintenance. The programme of care and maintenance refers to processes and conditions regarding a closed mine site where operations are likely to recommence in future.[1495] During this phase, production is stopped, but the site is managed in such a way that it remains in a safe and stable condition for future mining.[1496] The programme of care and maintenance can either

[1488] S 7(f) of Regulations on use of Water for Mining and Related Activities Aimed at the Protection of Water Resources.
[1489] S 7(f).
[1490] See section 2.2.3 of Chapter Two of this thesis.
[1491] Laurence (2006) *Journal of Cleaner Production* 286 & 290.
[1492] See section 2.2.3 of Chapter Two of this thesis.
[1493] Australia Department of Industry, Tourism and Resources *Mine Closure and Completion:* 1.
[1494] S 9 of Regulations on use of Water for Mining and Related Activities Aimed at the Protection of Water Resources.
[1495] S 16 of NEMA Financial Provisioning Regulations of 2015.
[1496] S 16; Enhance Place Pty Ltd *Care and Maintenance Mining Operations Plan* (2016) 4.

take place at a predetermined time or be improvised but must last for a specific timeframe not exceeding five years.[1497]

From a legal perspective, a mine's life cycle is only considered complete once the mine has ceased operations and a closure certificate is issued by the Minister of Mineral Resources and Energy.[1498] A closure certificate is issued upon provision of documents such as the closure plan, which includes an environmental risk report indicating that the closed mine is to be rehabilitated in accordance with required standards.[1499]

Mine rehabilitation or mine completion, on the other hand, refers to the restoration of the post-mined landscape to a state suitable for future use of the land or area.[1500] A proper rehabilitation process largely depends on meaningful transparency and consultation.[1501] The purpose of transparency and consultation is to ensure accountability to stakeholders in general and, in particular, to affected or concerned communities whose well-being to some extent depends on a successfully rehabilitated mine site.[1502]

The mine closure and rehabilitation phase is the responsibility of the holder of a prospecting right, mining right, retention permit, mining permit or a previous holder of an old order right or owner of mine works that have ended.[1503] The primary reason for mine closure and rehabilitation is to avoid mines being abandoned and thus causing long-term detrimental environmental issues.[1504] Such issues are more likely to emerge when the rehabilitation phase is not appropriately addressed.[1505]

[1497] S 16(4)(a) of NEMA Financial Provisioning Regulations.
[1498] S 24R(1) of NEMA; S 43 of the MPRDA.
[1499] S 43(2) of the MPRDA; Krause & Snyman *Rehabilitation and Mine Closure Liability:* 1.
[1500] M Zupunski, S Pajevic, D Arsenov, N Nikolic, A Pilipovic & M Borisev "Insights and lessons learned from the long-term rehabilitation of abandoned mine lands - A plant-based approch" in MNV Prasad, PJ de Campos Favas & SK Maiti (eds) *Bio-Geotechnologies for Mine Site Rehabilitation* (2018) 215 220.
[1501] A Morrison-Saunders, P Gorey, D Doepel, H Mtegha & MP McHenry *Enhancements in mine closure planning in Western Australia and possible applications for Africa* (2014) Mine Closure 3 & 9.
[1502] Australia Department of Industry, Tourism and Resources *Mine Closure and Completion:*1.
[1503] S 34 MPRDA Amendment Act.
[1504] A Robertson & S Shaw *Mine closure* (2006) Info Mine E-book 3 & 5.
[1505] Limpitlaw et al. (2005) *SAIMM* 3.

Effective closure or rehabilitation of mines is required to ensure access to future resources like water, for communities in which mine operations took place.[1506] To achieve a successful closure and rehabilitation, those responsible for the mine project must acknowledge the need for and a duty to ensure environmental sustainability.[1507] Mine closure and rehabilitation are required to be carried out in an organised and effective manner to avoid a situation where a previous mine site may continue to be hazardous or could be a source of pollution to water resources.[1508] Above all, the primary objective of a mine completion process is to avoid or mitigate its adverse and long-term effects, which are generally environmental.[1509] It is also aimed at guaranteeing water resources for future use.[1510]

Mine closure and rehabilitation are best achieved when a proper plan is in place and implemented from the start and progressively as the mine operations progress.[1511] Successful rehabilitation requires adequate planning, monitoring and trials, as well as the assignment of funds to finance the implementation of the closure and rehabilitation plan.[1512] Applicants for environmental authorisations are required to set aside financial provisions[1513] (to be held by the Minister of Mineral Resources and Energy) for rehabilitation purposes.[1514] Should any right holder fail to rehabilitate the environment, the Minister of Mineral Resources and Energy may make use of part or all the funds provided by the holder to rehabilitate the environment.[1515] A mine is considered completed and rehabilitated once it reaches a state where ownership of a mine can be relinquished by the current owner and the next land user can take over.[1516] In terms

[1506] D Limpitlaw & A Briel "Post-mining land use opportunities in developing countries-a review" (2014) 114 *SAIMM* 899 899-900.
[1507] Z Nzimande & H Chauke "Sustainability through responsible environmental mining" (2012) 112 *SAIMM* 135 138.
[1508] And socio-economical. See S 24 NEMA.
[1509] Committee on Abandoned Mine Land Research Priorities, Board on Mineral Energy Resources, Mathematics Commission on Physical Sciences, and Resources & National Research Council *Setting Priorities for Abandoned Mine Land Research* (1987) 34.
[1510] Australia Department of Industry, Tourism and Resources *Mine Closure and Completion:* 1.
[1511] DM Mchaina "Environmental planning considerations for the decommissioning, closure and reclamation of a mine site" (2001) 15 *International Journal of Surface Mining, Reclamation and Environment* 163 164 & 176.
[1512] Mchaina (2001) *International Journal of Surface Mining, Reclamation and Environment* 174-175.
[1513] S 1(1) Financial provision (b) of NEMA.
[1514] S 24P(1) & (5) of NEMA.
[1515] S 24P(2).
[1516] Alberts et al. (2017) *The Extractive Industries and Society* 269; Laurence (2006) *Journal of Cleaner Production* 286.

of water protection, mine completion ultimately determines what is left behind as a benefit or legacy for future generations.[1517]

The above discussion suggests that the issue of environmental degradation and water pollution, in particular, is taken seriously by the South African lawmakers. It demonstrates that water pollution can be controlled in the South African mining sector to some extent.[1518]

4 Conclusion

This chapter has evaluated the extent to which the South African legal framework promotes water sustainability in the South African mining sector. For the purpose of water protection, the discussions in this chapter show that the Constitution sets a mandate for the state to achieve water sustainability in the mining sector. The mandate can be pursued through law and policymaking, as well as legal interpretation. The mandate is also pursued through administrative action aimed at legal implementation and enforcement.[1519]

It is concluded that there are various provisions applicable to environmental issues in the mining sector that can achieve water sustainability, as highlighted throughout this chapter. Water sustainability is more likely as the provisions conform to some form of fairness and justice.[1520] Applicable laws can also achieve positive results such as good environmental governance, thus water sustainability as promoted through EIAs and EMPrs.[1521] Water sustainability is more likely to be achieved, if and when, decisionmakers allow themselves to be guided by existing laws and reasonable judicial decisions aimed at environmental protection.[1522] Successful decision making and effective administrative actions are possible if principles of good governance as promoted through rules and regulations are properly implemented and enforced.[1523]

[1517] Laurence (2006) *Journal of Cleaner Production* 294.
[1518] Alberts et al. (2017) *The Extractive Industries and Society* 270.
[1519] See section 3.1.2 of this Chapter.
[1520] Verdonck (2015) 9 *Hum. Rts. & Int'l Legal Discourse* 38-39; S 33(1) of the Constitution.
[1521] See sections 3.1.1.2 & 3.1.1.3 of this chapter.
[1522] P Blunt "Cultural relativism,'good'governance and sustainable human development" (1995) 15 *Public Administration and Development* 1 6.
[1523] Liebenberg *Socio-economic Rights:* 34-35.

The current level of water pollution in the said mining sector,[1524] unfortunately, leads to the conclusion that the current South African environmental legal framework has its shortcomings, as discussed in the following chapter.

[1524] See section 3 of Chapter Two of this thesis.

CHAPTER SEVEN: SHORTCOMINGS OF THE LEGAL FRAMEWORK IN PROMOTING DECISION MAKING FOR WATER SUSTAINABILITY IN THE SOUTH AFRICAN MINING SECTOR

1 Introduction

The legal framework, as discussed in the previous chapter, is essential in the enforcement of water sustainability through good environmental governance.[1525] Enforcing water sustainability helps to mitigate water pollution in the South African mining sector.[1526] However, the legal framework discussed in Chapter Six of this thesis can become problematic and fall short of achieving its aim effectively.[1527] An issue likely to impede effective implementation and enforcement of laws is the shortcomings within the legal framework, as discussed hereunder.

Continuous pollution of water resources in the South African mining sector can be partially attributed to shortcomings in the legislation aimed at the protection of water resources in the mining sector.[1528] Such shortcomings may explain why water pollution control is still a major issue in the South African mining sector, despite the potential of the legal framework to preserve water resources.[1529]

This chapter analyses the shortcomings in the legal framework to highlight how and why they hamper legislative effectiveness in preventing or minimising water pollution in the mining sector. Such shortcomings in the legal framework include lack of clarity as well as uncertainty about legal interpretation and allocation of responsibility which are likely to undermine adequate water protection in the mining sector.[1530]

The discussion in this chapter highlights specific shortcomings in the provisions applicable to the protection of water resources at the different phases of a mining life

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[1525] As highlighted in Chapter four of this thesis.
[1526] See section 4 of Chapter Three of this thesis.
[1527] K Bentley & R Calland "Access to information and socio-economic rights: A theory of change in practice" in M Langford, B Cousins, J Dugard & T Madlingozi (eds) *Socio-Economic Rights in South Africa: Symbols Or Substance?* (2014) 341 361.
[1528] C Wood "Environmental impact assessment in developing countries: an overview" (2003) unpublished paper presented at the Conference on New Directions in Impact Assessment for Development: Methods and Practice 2003 8 & 20-21; R Bowd, N Quinn & D Kotze "Toward an analytical framework for understanding complex social-ecological systems when conducting environmental impact assessments in South Africa" (2015) 20 *Ecology & Society* 1 4.
[1529] See discussions in Chapter two of this thesis.
[1530] J Cobbing & C Rose-Innes "Groundwater Governance: The Case of the Grootfontein Aquifer at Mahikeng, South Africa" (2018) 11 *Water Alternatives* 607 617.

cycle. The discussion highlights how water protection is and can be undermined at the planning, operational and closure phases of mining due to shortcomings within the legal framework.

2 Planning Phase: Factors Undermining Environmental Protection

The prevention of water pollution would be less effective if provisions applicable to the planning phase of mining are flawed, specifically those concerning the environmental authorisation process.[1531] As Chapter Six argues,[1532] the best opportunity to prevent water pollution in the mining sector is to ensure the proper implementation of the necessary measures at the planning phase, prior to the commencement of mining operations. The South African environmental legal framework makes provision for environmental authorisation and its prerequisites, including environmental impact assessment (EIA) and related requirements, such as the scoping report and environmental management programme.[1533]

However, certain provisions applicable to the planning phase of mining and specifically to the environmental authorisation process are flawed.[1534] As shown below, the ability of the environmental authorisation process to prevent - or at least mitigate - water pollution, is likely to be limited due to limited impact assessment methods, public participation processes and timeframes.

2.1.1 Inadequate Assessment Methods

The legal framework provides methods to prevent or mitigate water pollution, as highlighted in Chapter Six.[1535] The adequacy of methods for the assessment of the environmental impacts[1536] of mining is however questionable,[1537] especially regarding how certain provisions of the EIA regulations are formulated.

While the intention of EIA regulations is commendable, they do not clearly prescribe how EIAs are (or should be) conducted. NEMA regulations prescribe the type of

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[1531] L Leonard "Examining environmental impact assessments and participation: the case of mining development in Dullstroom, Mpumalanga, South Africa" (2017) 19 *JEAPM* 1 2.
[1532] See section 3.1.1 of Chapter Six of this thesis.
[1533] S 38A of the MPRDA; S 24(4A) of NEMA read with S 24(4)(b) of NEMA; EIA Regulations of 2014.
[1534] P Lukey, T Cumming, S Paras, I Kubiszewski & S Lloyd "Making biodiversity offsets work in South Africa–A governance perspective" (2017) 27 *Ecosystem services* 281 283.
[1535] See section 3.1 of Chapter Six of this thesis.
[1536] Including water pollution.
[1537] CER, CALS, GroundWork, SDCEA, VEJA, HEJN & Earthjustice *Joint Stakeholders' Submission on: The threats to human rights from mining and coal-fired power production in South Africa* (2017) 9.

information relating to impact assessments that must be contained in EIA reports, as well as in scoping reports and environmental management programmes (EMPrs).[1538] The regulations, however, do not provide any guidelines to be followed in compiling the reports.[1539] Lack of guidelines means that it becomes the duty of an Environmental Assessment Practitioner (EAP) to decide and employ the best possible method necessary to ensure adequate environmental assessment.[1540] Similarly, the EAP must ensure that the methods used are adequate, and thus, produce reliable data.[1541] Though EAPs are professionals,[1542] the state as the decisionmaker regarding environmental authorisations cannot guarantee that reports compiled by EAPs adhere to the standards,[1543] provided in the EIA regulations.[1544]

The judgment in *State v Stefan Frylinck and Other* demonstrated that a report[1545] prepared by an EAP had misled the Department of Environmental Affairs in the authorisation of a planned construction project.[1546] Frylinck (an environmental consultant) hired by Mpofu Environmental Solutions CC conducted an impact assessment and compiled a report in which he failed to establish that there was a wetland on the property where the construction was planned.[1547] The Court acquitted Frylinck of fraud, but gave him a fine, as it concluded that the EIA methods employed were flawed and the standard of work[1548] carried out during the EIA process was unreasonable.[1549]

The above case illustrates the challenges that the state faces in relying on potentially flawed EIA reports. Should reports regarding planned mining projects lack accuracy due to inadequate assessment methods, as shown above, the Minister of Mineral

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[1538] See section 3.1.1.2 of Chapter Six of this thesis.
[1539] C Wood *Environmental Impact Assessment: A Comparative Review* (2014) 174.
[1540] DEA *20 Years of Environment Impact Assessment in South Africa* (2018) 8; Leonard (2017) *JEAPM* 10.
[1541] Leonard (2017) *JEAPM* 10.
[1542] Kidd & Retief "Environmental assessment" in *Environmental Management in South Africa* 995.
[1543] Leonard 10; B Kengni "Intergovernmental relations: One Environmental System" in L Van Schalkwyk (ed) *Co-ordinating Governance for Mining: Streamlining Systems for Improved Intergovernmental Relations* (2019) 47.
[1544] Regulation 13 of the EIA Regulations of 2014.
[1545] Required under EIA regulations as explained in Chapter six of this thesis.
[1546] *State v Stefan Frylink and Mpofu Environmental Solutions CC (14/1740/2010) [2011] Regional Division of North Gauteng.*
[1547] (14/1740/2010) [2011], paras 1 & 54.
[1548] Standard works in terms of the EIA regulations.
[1549] (14/1740/2010) [2011], paras 54-55.

Resources is likely to be misled in its decision-making process.[1550] Decisions made under these circumstances are, therefore, likely to fail in preventing or mitigating water pollution.[1551]

Though the Minister of Environment, Forestry and Fisheries or MEC[1552] "may" appoint an "external specialist to review" a completed assessment,[1553] this does not guarantee the prevention of water pollution. This is because such effort by the Minister or MEC only affects cases where "a high level of objectivity is required [and] which is not apparent in the documents submitted".[1554] This requirement suggests that some cases of environmental protection are more important than others, without providing details as to why and how such a level of objectivity is determined.

The shortcomings discussed above indicate that an EIA is likely to be ineffective when there is no guidance on methods to employ when conducting any such assessment. Such ineffective assessment is problematic and exacerbated by the fact that provisions relating to public participation processes, which form part of the EIAs, also have some shortcomings, as highlighted below.

2.1.2 Concerns with the Public Participation Process

As Chapter Five highlights,[1555] public participation is necessary to ensure that persons likely to be affected by the negative impacts of mining can voice their opinions. However, there are some concerns regarding the content and methods used during public participation processes in the mining context.

Regarding content, the legal framework does not indicate how much input affected or interested parties are expected to make.[1556] The extent to which input from affected or interested parties can influence a decision-making process regarding an environmental authorisation relating to prospecting and mining is also not clear.[1557] No

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[1550] Leonard (2017) *JEAPM* 2.
[1551] Momtaz & Kabir *Evaluating Environmental and Social Impact Assessment* 166; J Glasson, R Therivel & A Chadwick *Introduction to Environmental Impact Assessment* (2013) 70.
[1552] MEC is Member of the Executive Council to whom environmental affairs are assigned. See S 1 of NEMA.
[1553] S 24I of NEMA.
[1554] S 24I(b).
[1555] See section 3.2.2 of Chapter Five of this thesis.
[1556] M Marais, FP Retief, LA Sandham & DP Cilliers "Environmental management frameworks: Results and inferences of report quality performance in South Africa" (2015) 97 *South African Geographical Journal* 83 91-92.
[1557] Marais et al. (2015) *South African Geographical Journal* 91-92; Leonard (2017) *JEAPM* 12.

provision is made regarding any form of support granted to interested or affected parties to make informed decisions when commenting on proposed mining projects.[1558] This is exacerbated when mining companies fail to give proper consideration to concerned communities' interests.[1559]

As highlighted in the *Bengwenyama Minerals* case,[1560] affected parties' interests are better served when their rights are acknowledged by creating space for them to participate in policymaking.[1561] The case concerned the lawfulness of the granting of a prospecting right to Genorah Resources (Pty) Ltd on community land.[1562] The community challenged the award of prospecting rights on the grounds that amongst others, there were shortcomings in the required consultation process.[1563] The community also raised the lack of administrative fairness in the granting process.[1564]

The judgment highlighted that just administrative action requires good faith on the part of the company when conducting the public participation process.[1565] The Constitutional Court held that Genorah had failed to consult with the community as statutorily required.[1566] Accordingly, the community's constitutional right to just administrative action[1567] was flouted.[1568] This outcome shows that the consultation process ignored the community's opinion regarding the planned project and its environmental impacts on their land.[1569]

The mining right applicant is also required to give notice to interested and affected parties in such a way as to ensure that they can understand what the project entails.[1570] However, this thesis underscores that this provision does not necessarily guarantee that the interested or affected parties can influence the outcome of the

[1558] DEA *Public Participation guideline in terms of NEMA EIA Regulations* (2017) 9 & 11.
[1559] Munnik et al. (2010) *Environmental Monitoring Group* 9 & 16.
[1560] (CCT 39/10) [2010] ZACC 26.
[1561] (CCT 39/10) [2010] ZACC 26, para 66.
[1562] (CCT 39/10) [2010] ZACC 26, para 1.
[1563] The traditional leader was informed of Genorah's intention to speak to him about certain prospecting applications. A representative of Genorah left a prescribed consultation form which simply provided yes or no blocks to be ticked or indicate any objections to prospecting applications. No one signed the form on behalf of the Community. See (CCT 39/10) [2010] ZACC 26, para 9
See also Para 11 of the case.
[1564] (CCT 39/10) [2010] ZACC 26, para 1-4; Humby (2012) *PELJ* 182.
[1565] Humby (2012) *PELJ* 182.
[1566] (CCT 39/10) [2010] ZACC 26, para 13.
[1567] S 33 of the Constitution.
[1568] (CCT 39/10) [2010] ZACC 26, para 84.
[1569] (CCT 39/10) [2010] ZACC 26, para 87.
[1570] Regulation 41(2) of the EIA Regulations of 2014.

decision-making process. Interested and affected parties should make a meaningful contribution as to whether a mining project should be authorised or not, since they are stakeholders as far as the planned project is concerned.[1571] Their participation should be important at any stage of a mining project because they tend to be the most affected by the environmental impacts of mining as Chapter One indicates.[1572]

Another shortcoming in the public participation process is highlighted in Save the Vaal.[1573] This case was an appeal against the judgment of the High Court.[1574] The application in the High Court sought to have the decision of the Director of Mineral Development, Gauteng Region to grant a mining authorisation for mining activities in the Sasolburg area, reviewed and set aside due to a lack of public participation.[1575] The High Court, in its ruling, stated that the organisation Save the Vaal Environment could not stop the Director from making a decision that ensured that mineral resources are used optimally.[1576] The Court, however, stated that Save the Vaal Environment was entitled to make representations relating to an environmental authorisation process and, therefore, set aside the Director's decision to grant a mining authorisation.[1577]

The main issue of contention in the appeal of the Save the Vaal case was whether an unincorporated association of landowners with valid environmental concerns had the right to raise such concerns while only a mining right was granted and an environmental authorisation was still pending.[1578] The argument put forward by the appellant was that the respondents had to wait for the approval of an environmental management programme before raising any environmental issues, as provided by the applicable legislation at the time.[1579] The Court, in its ruling, made it clear that administrative processes should accord proper consideration to environmental issues and how they affect people's lives at all times.[1580] A safe environment can only be

[1571] Regulation 40(1)(b) of the EIA Regulations of 2014; (CCT 39/10) [2010] ZACC 26, para 66.
[1572] See section 1 of Chapter One of this thesis.
[1573] (133/98) [1999] ZASCA 9.
[1574] Witwatersrand Local Division. See *Save the Vaal v The Director Mineral Development Gauteng Region and Others (97021011) [1997],* unreported.
[1575] (133/98) [1999] ZASCA 9, para 1.
[1576] (97021011) [1997], unreported.
[1577] (97021011) [1997], unreported.
[1578] (133/98) [1999] ZASCA 9, para 1.
[1579] See S 9 of the Minerals Act 50 of 1991.
[1580] (133/98) [1999] ZASCA 9, para 20.

achieved if environmental rights are acknowledged as fundamental and justiciable human rights,[1581] as promoted in the Constitution.[1582] In this case, the Supreme Court of Appeal reiterated the affected party's right to be heard, especially when something as important as a safe environment is concerned.[1583]

The above analysis shows that the inability of interested or affected parties to participate properly and influence decisions relating to environmental authorisation processes can be due to shortcomings in the legal framework. Though courts rectify identified shortcomings in the process, the Witwatersrand Local Division's ruling in the *Save the Vaal* case indicates that courts, in their interpretation of the laws, can reach decisions contested for being wrong or flawed. Contested decisions are also likely to arise due to a lack of clear guidance within the legal framework.[1584] Another flaw associated with environmental authorisations, as discussed below, is limited timeframes for aspects such as public participation processes.

2.1.3 Problematic Timeframes

Issues identified under sections 2.1.1 and 2.1.2 above may in part be caused by the limited timeframes within which applicants for environmental authorisations are required to submit their applications.[1585] The above issues suggest that effective water protection in the mining sector depends on the legal framework granting timeframes that afford enough time to compile a comprehensive environmental authorisation application.

Public participation is an example of a process or aspect of an EIA that can suffer because of limited timeframes. The minimum timeframe of thirty days within which public participation is required to take place may not be enough to consult large communities and accommodate comments from interested parties.[1586] This is the case, especially when interested parties need more time to provide comments

[1581] E Daly & JR May "Learning from constitutional environmental rights" in JH Knox & R Pejan (eds) *The Human Right to a Healthy Environment* (2018) 42 42-43; S Atapattu "The right to a healthy environment and climate change" in J.H. Knox & R. Pejan (eds) *The Human Right to a Healthy Environment* (2018) 252 266.
[1582] S 24 of the Constitution. See also section 2 of Chapter Six of this thesis.
[1583] (133/98) [1999] ZASCA 9, para 20.
[1584] MD Bellis "The illusion of clarity: A critique of 'pure' clarity using examples drawn from judicial interpretation of the Constitution of the United States" in A. Wagner & S. Cacciaguidi-Fahy (eds) *Obscurity and Clarity in the Law: Prospects and Challenges* (2008) 197 199.
[1585] Regulation 16(2)(a) of the EIA Regulations of 2014.
[1586] Regulation 3(8) of the EIA Regulations of 2014; Leonard (2017) *JEAPM* 13.

regarding a planned mining project.[1587] Since there is no maximum timeframe, the minimum required timeframe suggests that it is up to the project manager or EAP to be reasonable and determine how much time is adequate for active participation,[1588] as long as such time is not less than thirty days. This implies that durations of more than thirty days will merely be at the discretion of project managers and may still not be enough for proper public participation. It cannot, therefore, be guaranteed that such timeframes determined by project managers are indeed enough.[1589]

Limited timeframes discussed above may lead to a situation whereby ineffective or negative decisions are made by project managers and EAPs due to insufficient information, and thus, misleading reports being compiled during an EIA process.[1590] The possibility of incomplete and misleading reports is more likely because an applicant for environmental authorisation who misses an application deadline is likely to see its application being closed automatically.[1591] Such a possibility is not a desirable position to be for an applicant. A closed application means restarting the whole environmental authorisation process or appealing the decision of the competent authority or taking it on review, which comes with a cost.[1592]

The discussion above shows that an environmental authorisation process can fail to meet its objective at the planning phase of mining. More so if applicants for such authorisation fail to set aside sufficient time to conduct public participation, for instance, to achieve effective EIAs. The section that follows is an analysis of how shortcomings within the legal framework can hamper the protection of water resources during mining operations.

3 Operational Phase: Uncertainty Regarding Effective Environmental Decision-Making

The law has an important role to play in ensuring that water resources are well protected amidst mining activities. However, some provisions on environmental protection are not clear as to what they promote or what they are meant to achieve.[1593]

[1587] Leonard (2017) *JEAPM* 6 & 13.
[1588] Bowd et al. (2015) *Ecology & Society* 3.
[1589] Leonard (2017) *JEAPM* 13.
[1590] Truter "Environmental law compliance: The noose is tightening".
[1591] S 22(4) MPRDA.
[1592] S 96.
[1593] RP Wynberg & M Sowman "Environmental sustainability and land reform in South Africa: A neglected dimension" (2007) 50 *Journal of environmental planning and management* 783 792; L Feris

The following discussion highlights two main instances where uncertainty is created rather than realising that which the provisions seek to achieve: these include section 24G of NEMA and the "One Environmental System".

3.1 Uncertainty surrounding Section 24G of the National Environmental Management Act

Mining operators and members of society have regularly raised issues relating to lack of clarity and uncertainty in certain provisions due to the insertion of provisions that cannot adequately realise water protection.[1594] This is the case with section 24G of NEMA, which regulates unlawful commencement of mining activities. In terms of section 24G mining companies can ex post facto legalise their activities after they have admitted guilt and paid a fine of up to five million rand.[1595]

Section 24G is perceived as an anomaly as it does not seek to prevent environmental pollution. Instead, it is an ex post facto authorisation which aims only to correct environmental harm that has already occurred.[1596] Section 24G provides for ways to hold offenders responsible and ensure that the damage is repaired.[1597] The section, however, lacks clarity and potential to mitigate or deal with issues of water pollution properly.[1598]

Section 24G provides, for instance, that a person "may" be directed to undertake environmental rehabilitation or to take certain necessary steps,[1599] within a certain timeframe and under certain conditions deemed necessary.[1600] Questions are thus raised regarding when and to what extent a person should be held responsible for environmental wrongdoing.[1601] Such questions are raised based on the fact that

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"Constitutional environmental rights: an under-utilised resource" (2008) 24 *South African Journal on Human Rights* 29 49.

[1594] CER "Mining companies launch their first attacks on the One Environmental System" (17-06-2019) *News* https://cer.org.za/news/mining-companies-launch-their-first-attacks-on-the-one-environmental-system (accessed 10-05-19); A Fourie & Alan Colin Brent "A project-based mine closure model (MCM) for sustainable asset life cycle management" (2006) 14 *Journal of Cleaner Production* 1085 1087; CER "As new environmental laws for mines start coming into effect, confusion reigns" (04-09-2014) *News* https://cer.org.za/news/as-new-environmental-laws-for-mines-start-coming-into-effect-confusion-reigns (accessed 10-05-2019).

[1595] 24G(4) of NEMA.

[1596] OECD *OECD Environmental Performance Reviews: South Africa 2013* (2013) 51.

[1597] S 24G(3) & (4) of NEMA.

[1598] R Paschke & J Glazewski "Ex post facto authorisation in South African environmental assessment legislation: a critical review" (2006) 9 *PELJ* 1 24.

[1599] S 24G(3)(b) of NEMA.

[1600] S 24G(3) of NEMA.

[1601] Paschke & Glazewski (2006) *PELJ* 25.

decisionmakers are not provided with specifics for the reparation of environmental damage caused by mining.[1602]

Section 24G also fails to provide for defined timeframes and conditions necessary for environmental rehabilitation, and this is left to the sole discretion of the relevant officials.[1603] Thus, under such circumstances, ways in which a person is directed to repair damage caused to the environment depends on how serious and important government decisionmakers perceive a specific issue.[1604] It is also possible that decisions or directions given by government officials would vary from one case to another.[1605] Such variance does not necessarily result from legitimate differences, such as different levels of pollution.[1606]

Secondly, section 24G is problematic as it is seen as encouraging non-compliance with provisions relating to environmental protection rather than seeking to prevent or limit environmental pollution.[1607] In terms of section 24G of NEMA, mining companies are allowed to apply for environmental authorisation after they have already caused harm to the environment. Such application is nothing more than a attempt to rectify an "[u]nlawful commencement of listed activities" during which an administrative fine must be paid,[1608] and impact assessment reports compiled if the minister deems necessary.[1609] This thesis argues that by providing for unlawful commencement to be rectified, section 24G also provides potential offenders with a reason to disregard obtaining an environmental authorisation as a prerequisite for mining. This is especially where the environmental authorisation process may take longer than the company expects or where the company is not able to fulfil some of the basic requirements to obtain an environmental authorisation.[1610]

[1602] LMF September *A critical analysis of the application of S24G provisions of the National Environmental Management Act (NEMA): The Gauteng Province Experience* MSc Thesis North-West University (2012) 1 of Appendix B.
[1603] Minister of Environmental Affairs, Minister of Mineral Resources or MEC (to whom the Premier has assigned responsibility for environmental affairs). See S 24G(3)(a) of NEMA.
[1604] Paschke & Glazewski (2006) *PELJ* 22-23; M Van der Linde "National Environmental Management Act 107 of 1998 (NEMA)" in HA Strydom, ND King, RF Fuggle & MA Rabie (eds) *Environmental Management in South Africa* 2nd ed (2009) 193 207.
[1605] M Fourie "How civil and administrative penalties can change the face of environmental compliance in South Africa" (2009) 16 *SAJELP* 93 101.
[1606] OECD *OECD Environmental Performance Reviews:* 51.
[1607] Paschke & Glazewski (2006) *PELJ* 21; OECD *OECD Environmental Performance Reviews:* 51.
[1608] S 24G(4) of NEMA.
[1609] S 24G(1)(b)(vii).
[1610] OECD *OECD Environmental Performance Reviews:* 51.

Though an offender is liable to pay a fine, the fine amount may be insignificant compared to that which the offender may reap for commencing mining earlier without an environmental authorisation.[1611] Thus, a company is likely to start mining without the required environmental authorisation if it deems that the expected fine could only be a fraction of what it stands to gain by mining without the necessary environmental authorisation.[1612]

Section 24G is a legislative anomaly as it makes way for mining companies to commit unlawful acts, then legalise them by admitting guilt, rehabilitating, submitting impact assessment reports and paying a fine.[1613] The legalisation is only possible if the ministers in charge of environmental affairs and mineral resources or the MEC deem it necessary.[1614] Such a scenario raises issues as to whether there can be rational decision-making or effective cooperative governance in this instance.[1615] As concerning as it may be, the uncertainty surrounding section 24G of NEMA is not a unique instance of gaps in the legal framework, as highlighted below.

3.2 Limitations of the "One Environmental System"

The "One Environmental System" (OES) came into force to render environmental protection in the mining sector more coordinated, with the aim of improving its effectiveness.[1616] The OES has, however, caused concerns as to whether it can achieve better environmental protection.[1617] Similarly, some authors are concerned as to whether the Minister of Mineral Resources is the appropriate authority to implement and enforce environmental regulation in the mining sector.[1618]

[1611] Paschke & Glazewski (2006) *PELJ* 25.
[1612] K Bobbins *Acid mine drainage and its governance in the Gauteng City-Region* (2015) GCRO Occasional Paper 50.
[1613] S 24G(4) of NEMA; Fourie (2009) *SAJELP* 102.
[1614] S 24G(1)(b) & (3) of NEMA.
[1615] Cooperative governance is explained in section 3.1 of Chapter Five of this thesis. See also Fourie (2009) 16 *SAJELP* 102; L Kohn "The anomaly that is Section 24G of NEMA: An impediment to sustainable development" (2012) 19 *SAJELP* <http://www.laurenkohn.co.za/wp-content/uploads/2015/12/The_anomaly_that_is_section_24G_of_NEMA.pdf> (accessed 14-11-2019).
[1616] As indicated in section 3.1.2 of Chapter Six of this thesis.
[1617] S Plagerson & L Stuart *Social, Economic and Environmental Policy Complementarity in the South African Mining Sector* (2018) 13; R Chevallier *Illegal sand mining in South Africa* (2014) *Policy Briefing 116* 4; PMG "One Environmental System Colloquium" (20-11-2018) <https://pmg.org.za/committee-meeting/27570/> (accessed 25-05-2019).
[1618] A Shivamba *Mining for Sustainable Development* (2017) 2; Humby (2015) *JERL* 128.

It is contested whether the Department of Mineral Resources and Energy (DMRE) can adequately implement and enforce environmental regulation in the sector, even where that action might hamper economic development.[1619] The DMRE's ability to implement and enforce environmental regulation is also likely to be hampered by its application processing times, which have been criticised as lengthy and inefficient.[1620] The DMRE also does not always seem to demonstrate a good understanding of the environmental legislation and an ability to enforce environmental protection.[1621] The EIA application requirement contained in environmental provisions is not familiar to the DMRE's employees.[1622] Thus, as per DMRE's admission,[1623] it is not certain that it can handle the administrative burden associated with processing prescribed EIA requirements within set timeframes while also pursuing its primary mandate.[1624]

It is argued that entrusting environmental protection to officials of the DMRE is similar to the "lion protecting the lamb".[1625] The primary mandate of the DMRE is to ensure the sustainable development of mineral resources, which has significant adverse effects on the environment, as indicated in Chapter Two of this thesis.[1626] Giving the DMRE the responsibility to protect the environment, therefore, amounts to requiring it to protect that which it is very likely to destroy if it must achieve its main mandate.[1627]

It is also not clear why the implementation of the NWA is dissociated from the MPRDA and NEMA.[1628] This raises concerns as the implementation of the NWA does not form part of the environmental authorisation and may hamper the very aim of the OES. For example, it is not likely that time-consuming processes will be properly eliminated as

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[1619] Alberts et al (2017) *The Extractive Industries and Society* 274.
[1620] Corruption Watch *Mining for sustainable development* (2017) 29-30.
[1621] Kengni "Intergovernmental relations: One Environmental System" in *Co-ordinating Governance for Mining: Streamlining Systems for Improved Intergovernmental Relations* 48.
[1622] Leonard (2017) *JEAPM* 14-15.
[1623] Kengni "Intergovernmental relations: One Environmental System" in *Co-ordinating Governance for Mining: Streamlining Systems for Improved Intergovernmental Relations* 48.
[1624] Republic of South Africa *Report on the Implementation Evaluation of the Effectiveness of Environmental Governance in the Mining Sector* (2015) Evaluation of the Environmental Governance Framework in the Mining Sector v; Leonard (2017) *JEAPM* 15.
[1625] S Gore "The Environmental Law Rubicon regulating mineral operations – latest developments" (16-09-2014) *Environmental Alert* <https://www.cliffedekkerhofmeyr.com/en/news/publications/2014/environmental/environmental-alert-17-september-the-environmental-law-rubicon-regulating-mineral-operationslatest-developments-.html> (accessed 31-08-2019).
[1626] See sections 3 and 4 of Chapter Two of this thesis. See also S 3 of the MPRDA regarding the mandate of the DMRE.
[1627] Chevallier *Illegal sand mining in South Africa* 4; Humby (2015) *JERL* 128.
[1628] S 24 of NEMA; S 38(a) of the MPRDA.

water licences are still to be applied for separately from environmental authorisations.[1629] Because the Department of Water and Sanitation took part in the initial discussions to establish the OES[1630] and the eventual amendment of the NWA,[1631] it would be expected that the NWA forms an integral part of the environmental authorisation process implemented by the DMRE as required under OES. This thesis acknowledges that environmental authorisations issued under NEMA may cover water protection to some extent. However, the thesis argues that such authorisations do not eliminate the fact that including the implementation of the NWA in the environmental authorisation process relating to mining can be more impactful. Such impact includes having water licences issued simultaneously and timeously with other authorisations and permits.[1632] Water regulation will thus be more effective in avoiding situations where companies may be tempted to start mining operations while the issuance of water licences are still pending.[1633]

One may argue that the OES bears a positive sign of cooperative governance due to cooperation between the DMRE, the Department of Environment, Forestry and Fisheries and the Department of Water and Sanitation, to fight issues such as water pollution.[1634] However, it would be more effective if the NEMA and the NWA are implemented simultaneously under environmental authorisation processes in the mining sector. In that way, the protection of water resources could be more effective at the operational phase of mining and possibly limit the levels of water pollution that must be dealt with during the closure phase.[1635]

Such limitation of levels of water pollution is necessary as adequate water protection at the closure phase is not likely because some environmental provisions applicable thereto also lack clarity. This is the case of provisions relating to financial provision for environmental rehabilitation discussed below.

[1629] S 40 of the NWA.
[1630] Humby (2015) *JERL* 121.
[1631] 123.
[1632] It also saves investors' time and money.
[1633] B van Koppen & B Schreiner "Priority General Authorisations in rights-based water use authorisation in South Africa" (2014) 16 *Water Policy* 59 71.
[1634] PMG "One Environmental System colloquium".
[1635] B Lottermoser *Mine Wastes: Characterization, Treatment and Environmental Impacts* 2nd ed (2003) 23-24.

4 Mine Closure: Lack of Clarity on Sustainable Closure Finances

Safeguarding the environment at the closure phase of mining is as important as it is in the planning or operational phases. Management and control of issues such as water pollution are as important at the closure phase because an abandoned mine or a poorly rehabilitated mine site is a serious threat to water resources, both underground and on the surface.[1636] Such a threat is often not clearly addressed by the same legal provisions aimed at preventing it. It is the case for instance, with the provisions dealing with financial provision for rehabilitation upon mine closure.[1637]

Many mining companies are bankrupt by the end of the mine's life cycle.[1638] Accordingly, it is justifiable to make provision for mine operators to set aside funds from the planning phase for purposes of rehabilitation.[1639] The Financial Provision Regulations provide that available funds, including financial guarantees with financial institutions and funds in a Rehabilitation Trust,[1640] must be transferred to the Minister of Mineral Resources and Energy.[1641] If and when the funds are transferred,[1642] it is supposed to hold funds set aside by mining companies for the Minister of Mineral Resources and Energy to make use of to rehabilitate mine sites if any of such companies fail to rehabilitate or remediate the "adverse environmental impacts".[1643] The transfer is expected to take place once a closure certificate has been issued under the MPRDA.[1644] That is when financial provision has been made for future rehabilitation of the environment disturbed by mining as provided in the Financial Provision Regulations.[1645]

The main issue is that these regulations do not specify the period within which the funds in the Rehabilitation Trust are to be transferred to the Minister of Mineral

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[1636] C Wolkersdorfer *Water Management at Abandoned Flooded Underground Mines:* 10.
[1637] S 24P of NEMA; Financial Provisioning Regulations of 2015.
[1638] Mhlongo & Amponsah-Dacosta (2015) *International Journal of Mining, Reclamation and Environment* 286; Durand (2012) *Journal of African Earth Sciences* 23 41.
[1639] K Matshusa & M Makgae "Prevention of future legacy sites in uranium mining and processing: The South African perspective" (2017) 86 *Ore Geology Reviews* 70 72.
[1640] Clause 3 of Appendix 2 of the Financial Provisioning Regulations of 2015.
[1641] Regulation 8(1) of the NEMA Financial Provisioning Regulations of 2015.
[1642] Because the trustees of the Optimum and Koornfontein rehabilitation funds were taken to court to prevent the mismanagement of such funds indicate the funds might never get to the DMRE. See A Seccombe "Trustees of mine rehabilitation funds accused of 'fraud' and 'theft'" (13-03-2018) *National* *https://www.businesslive.co.za/bd/national/2018-03-13-trustees-of-mine-rehabilitation-funds-accused-of-fraud-and-theft/*> (accessed 22-08-2019).
[1643] Regulation 14(5) of the NEMA Financial Provisioning Regulations of 2015.
[1644] S 43 of the MPRDA.
[1645] Regulations 4-7 of the NEMA Financial Provisioning Regulations of 2015.

Resources and Energy. Such lack of specification suggests that there is no guarantee that funds will be immediately available to the Minister of Mineral Resources and Energy for rehabilitation purposes if a closure certificate is issued.[1646] The possibility of funds not being made available when needed is possibly one reason why some mines are left unrehabilitated in South Africa for so long.[1647] Lengthy periods where mine are unrehabilitated across South Africa is generally due to lack of funds and insufficient funds.[1648]

Similarly, it is not clear how the Minister of Mineral Resources and Energy must keep and manage such funds once received.[1649] Lack of certainty regarding how funds must be kept raises a further question as to whether said funds are strictly earmarked for a specific mining operation or whether they are likely to be used on any other mine marked for rehabilitation.[1650] The concern here, as argued by this thesis, is that funds meant for the rehabilitation of a specific mine site might end up in a completely different project.

This lack of clarity raises transparency issues as it is difficult to conclude whether the provision of funds is clear enough for one to anticipate exactly how such funds could be handled.[1651] The transfer of funds to the Minister is supposed to be done transparently.[1652] Similarly, where the Minister deposits the said funds and where they are used, is supposed to go through a transparent process. Nonetheless, looking at the current regulations, it must be highlighted that transparency is not promoted.[1653] Consequently, decisionmakers' environmental rehabilitation efforts may lack

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[1646] IMF *South Africa: Technical Assistance Report-Fiscal Regimes for Mining and Petroleum: Opportunities and Challenges* (2015) 34.
[1647] K Forrest & L Loate "Power and Accumulation Coal Mining, Water and Regulatory Failure" (2018) 5 *The Extractive Industries and Society* 154 159.
[1648] ES Van Eeden, M Liefferink & JF Durand "Legal issues concerning mine closure and social responsibility on the West Rand" (2009) 5 *TD: The Journal for Transdisciplinary Research in Southern Africa* 51 62.
[1649] Regulation 14(4) & (5) of the Financial Provisioning Regulations of 2015.
[1650] WWF *Financial Provisions for Rehabilitation and Closure in South African Mining: Discussion Document on Challenges and Recommended Improvements* (2012) 33; PMG "Mining sector environmental governance; Rehabilitation in mining industry" (07-03-2017) *Environmental Affairs* <https://pmg.org.za/committee-meeting/24101/> (accessed 26-05-2019).
[1651] RD Krause & LG Synman *Rehabilitation and Mine Closure Liability:* 7; PMG "Mine Closure and Rehabilitation: Centre for Environmental Rights briefing" (25-10-2017) *Mineral Resources* <https://pmg.org.za/committee-meeting/25316/> (accessed 26-05-2019).
[1652] Krause & Synman *Rehabilitation and Mine Closure Liability:* 7.
[1653] Ch 2 of the Financial Provisioning Regulations of 2015.

effectiveness and efficiency, which is likely to result in a lack of accountable decision making.[1654]

5 Conclusion

This chapter establishes that despite the potential of the legal framework to prevent and mitigate water pollution in the mining sector, it also contains shortcomings that can undermine the prevention of water pollution. The shortcomings include provisions that lack clarity and create uncertainty, thus, undermining water protection as they cause limitations in terms of effective enforcement of water protection in the mining sector.[1655]

It arises from this chapter that section 24G of NEMA is an example of a legal provision that undermines the prevention of water pollution in the South African mining sector.[1656] The section only becomes helpful reactively to correct the harm already done to water resources and not to prevent such harm.[1657] The flaw in the section is further exacerbated by the failure of its provision to instruct decisionmakers to act in a specific manner, rather than taking certain measures in ways deemed appropriate by them.[1658]

Other provisions associated with shortcomings within the legal framework aimed at water protection, as established in this chapter, include the uncertain ability of certain aspects of the environmental authorisation process to prevent and ensure the mitigation of water pollution effectively. These include provisions relating specifically to aspects of environmental impact assessment, such as assessment methods, public participation and timeframes.[1659] The effectiveness of these aspects is essential to achieve sustainable water resources in the mining sector.[1660]

This chapter has also highlighted the good intention of the OES provisions and the financial provision for mine closure, despite the contents of those provisions being

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[1654] PMG “Mining sector environmental governance; Rehabilitation in mining industry” (07-03-2017) *Environmental Affairs* <https://pmg.org.za/committee-meeting/24101/> (accessed 26-05-2019).
[1655] Kohn (2012) 19 *SAJELP* .
[1656] See section 3.1 of this chapter.
[1657] OECD *OECD Environmental Performance Reviews:* 51.
[1658] Sec 24G(1)(b) & (3) of NEMA.
[1659] See section 2 of this chapter.
[1660] A Morrison-Saunders & F Retief "Walking the sustainability assessment talk—Progressing the practice of environmental impact assessment (EIA)" (2012) 36 *EIA Review* 34 35 & 37.

problematic.[1661] The OES grants to the competent authority powers that seem to be beyond, and in conflict with, its mandate.[1662] The content of the financial provision, on the other hand, fails to create transparency around funds held in trusts for mine closure.[1663]

Despite the shortcomings of the legal framework highlighted above, this thesis argues that the framework can still achieve water sustainability to some extent.[1664] There are provisions[1665] with the potential to prevent or minimise water pollution if effectively implemented and enforced through administrative action, and guided by the constitutional mandate relating to water protection. The following chapter of this thesis analyses the effectiveness of the legal framework in practice in the context of the South African mining sector.

[1661] See sections 3.2 and 4 of this chapter.
[1662] See section 3.2 of this chapter. See also PMG "Mine Closure and Rehabilitation: Centre for Environmental Rights briefing".
[1663] See section 4 of this chapter. See also Krause & Synman *Rehabilitation and Mine Closure Liability:* 7.
[1664] See analysis in Chapter Six, specifically section 4.
[1665] See Chapter Six of this thesis.

CHAPTER EIGHT: PROMOTION AND IMPLEMENTATION OF WATER SUSTAINABILITY IN THE MINING INDUSTRY THROUGH DECISION-MAKING PROCESSES

1 Introduction

Good governance through decision making has the potential to enhance organisational performance, including state administrative functions such as environmental protection.[1666] The performance of functions relating to environmental protection includes the promotion and assurance of water sustainability in the mining sector.[1667]

As highlighted in Chapter Two[1668] there are strong indications that several outcomes of decision-making processes lack the effectiveness required to deal with water pollution in the South African mining sector.[1669] Despite clear evidence of the adverse effects of mining, water pollution persists, thus, raising concerns as to why efforts to alleviate water pollution and its consequences for communities remain ineffective.[1670] This chapter asserts that shortcomings relating to environmental decision-making processes are a potential causal factor, despite the existing legal framework to promote water protection, as explained in Chapter Six above.[1671]

The legal framework certainly has shortcomings.[1672] However, this thesis argues that most provisions of the environmental legal framework can still improve the prevention of water pollution in the mining sector.

This difficulty for the legal framework to achieve its intended objective raises questions regarding the efforts of state officials tasked with the mandate to enforce water

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[1666] See section 2 of Chapter Six of this thesis.
[1667] Ashton et al. (2005) *Water SA* 450 & 454-455.
[1668] See sections 3 & 4 of Chapter Two of this thesis.
[1669] V Mjimba, M Mujuru & SS Mutanga "The legacy of acid mine drainage in South Africa" in M Mujuru & SS Mutanga (eds) *Management and Mitigation of Acid Mine Drainage in South Africa: Input for Mineral Beneficiation in Africa* (2016) 8 9-10; Gonah "Impact of acid minde drainage on water resources in South Africa" in M *Management and Mitigation of Acid Mine Drainage in South Africa: Input for Mineral Beneficiation in Africa* 55; Adler et al. (2007) *The Economics of Peace and Security Journal* 34; M Muller, B Schreiner, L Smith, B van Koppen, H Sally, M Aliber, B Cousins, B Tapela, M Van der Merwe-Botha & E Karar *Water Security in South Africa* (2009) *Development Planning Division DBSA: Paper Series* 8.
[1670] Forrest & Loate (2018) *The Extractive Industries and Society* 161.
[1671] See section 3 of Chapter Six of this thesis.
[1672] As explained in Chapter Seven of this thesis.

sustainability in the mining sector.[1673] Such concerns relate to the effectiveness of the legal framework, as well as its implementation and enforcement.[1674] The state is responsible for the mandate to make decisions regarding the implementation and enforcement of the legal framework in the South African mining context.[1675] The responsibility is discharged through government-appointed or delegated officials who become decisionmakers on behalf of the state.[1676]

Despite the efforts of state officials,[1677] the reality is that South Africa's scarce water resources are increasingly threatened by the adverse effects of mining.[1678] Based on the current situation, this chapter examines the state's decision-making processes relating to mining and environmental authorisations in the mining sector. This chapter also critiques the legal implementation and enforcement aimed at preventing or mitigating the effects of mining on the environment, in particular, water resources. In that regard, beside drawing from existing studies and reports, the analysis in this chapter weaves diverse courts cases to paint the picture of government incompetence and poor governance practices.

To achieve its aim, this chapter considers several elements of good governance, which are guided by the legal framework to address the issue of water pollution in the mining sector. For one, cooperative governance is discussed to emphasise the challenges confronting different government departments in their efforts to address water pollution collaboratively. Further, the accountability of decisionmakers is discussed to highlight the shortcomings and challenges of administrative action in dealing with the issue of water pollution in the mining sector. Transparency and public participation are then scrutinised to stress the extent to which the opinions of interested and affected parties are considered during decision-making processes. The purpose is to highlight the authority concerned communities have when actions are taken in relation to mining activities that are likely to have adverse effects such as water pollution. Finally, the

[1673] Forrest & Loate (2018) *The Extractive Industries and Society* 161.
[1674] L Leonard "State governance, participation and mining development: Lessons learned from Dullstroom, Mpumalanga" (2017) 44 *Politikon* 328; Matshusa & Makgae (2017) *Ore Geology Reviews* 77.
[1675] Para 3, Preamble of the MPRDA; Para 3, Preamble of the NEMA; Para 3, Preamble of the NWA, S 1 of PAJA.
[1676] See 4.1 of Chapter Four of this thesis.
[1677] Whether individually or collectively.
[1678] Naidoo *Acid Mine Drainage in South Africa:* 4.

effectiveness of environmental decision-making processes is analysed to highlight the efficiency and responsiveness of administrative action *in terms of* water protection.

2 Cooperative Governance for Water Protection

Cooperative governance, as explained in Chapter Five,[1679] promotes the pursuit of common purposes in a collaborative manner.[1680] The underlying purpose of cooperation should be to improve the effectiveness of tasks such as the prevention or management of water pollution.[1681]

In South Africa, strong cooperation and consultation among government departments concerned with environmental protection in the mining sector are required to enhance the protection of water resources.[1682] The One Environmental System (OES)[1683] is therefore supposed to ensure water protection through collaborative environmental decision making between the Department of Mineral Resources and Energy (DMRE) and the departments responsible for environmental affairs and water and sanitation.[1684]

Such collaborative measures are, however, not effective.[1685] It has emerged that the former Department of Mineral Resources (DMR),[1686] in control of the awarding of environmental authorisations often made decisions to grant applications regarding such authorisations, irrespective of the contradictory views of other departments.[1687] These are the departments responsible for environmental and water affairs which have expertise and mandate in terms of environmental and water protection respectively.[1688] The above situation weakens cooperative governance as concerned government departments cannot make significant impact on matters relating to

[1679] See section 3.1 of Chapter Five of this thesis.
[1680] Chap 3 of the Constitution; F Craigie, P Snijman & M Fourie "Environmental compliance and enforcement institutions" in AR Paterson & LJ Kotzé (eds) *Environmental Compliance and Enforcement in South Africa: Legal Perspectives* (2009) 65 68.
[1681] Princen (2003) *Global Environmental Politics* 37.
[1682] Swart (2003) *J. South. Afr. Inst. Min. Metall.* 492.
[1683] As explained in sections 2.2 of Chapter One and 3.1.2 of Chapter Six of this thesis.
[1684] Humby (2015) *JERL*129.
[1685] Forrest & Loate (2018) *The Extractive Industries and Society* 160.
[1686] C Colvin, A Burns, K Schachtschneider, A Maherry, J Charmier & M De Wit *Coal and water futures in South Africa: The case for protecting headwaters in the Enkangala grasslands* (2011) WWF-SA 30.
[1687] Colvin et al. *Coal and water futures in South Africa:* 30; Forrest & Loate (2018) *The Extractive Industries and Society* 160-161; Leonard (2017) *Politikon* 340.
[1688] D Takacs "South Africa and the human right to water: Equity, ecology, and the public trust doctrine" (2016) 34 *Berkeley J. Int'l L.* 55 60, 97 & 99.

environmental authorisations.[1689] Such departments are thus, disempowered in terms of fulfilling their constitutional mandate[1690] regarding the protection of resources such as water.[1691] Though the DMRE is the competent authority to implement environmental authorisations in the mining sector,[1692] for co-operative government purposes valuable inputs from the departments responsible for environmental and water affairs must be accorded proper attention.[1693]

The above reaffirms the indication that the DMRE's control over environmental authorisations is not suitable as the OES does not promote cooperative governance as it ought to.[1694] Rather, the system gives more power to the DMRE of which the main mandate is sustainable economic development in the mining sector.[1695] The current situation raises issues relating to conflict of interest,[1696] specifically with regard to the DMRE, which must promote economic development and water sustainability at the same time.[1697] Such an atmosphere is not suitable to pursue water sustainability and governance as explained in Chapters Three and Four respectively.[1698] Similarly, the atmosphere is not appropriate for the realisation of cooperative governance as defined in the Constitution[1699] and pursued in various legislations, including the MPRDA,[1700] NEMA[1701] and NWA.[1702]

An evaluation aimed at determining the success of environmental governance in the mining sector shows that cooperative environmental governance is still problematic.[1703] According to the evaluation, the role of the DMRE as the authority to implement and enforce mining-related environmental governance is less effective.[1704]

[1689] Plagerson & Stuart *Social, Economic and Environmental Policy Complementarity* 13.
[1690] See section 2 & 3 of Chapter Six of this thesis.
[1691] Colvin et al. *Coal and water futures in South Africa:* 30; Forrest & Loate (2018) *The Extractive Industries and Society* 160.
[1692] S 24(1) of NEMA.
[1693] S 41(1)(h)(iii) of the Constitution.
[1694] Plagerson & Stuart *Social, Economic and Environmental Policy Complementarity* 13.
[1695] DMR "Our vision & mission" <http://www.dmr.gov.za/about-dmr/overview> (accessed 25-09-2018); S 3(3) of the MPRDA.
[1696] Chevallier *Illegal sand mining in South Africa* 4; PMG "Mine Closure and Rehabilitation:".
[1697] S 2(h) of the MPRDA.
[1698] See section 4 of Chapter Three and section 4.3 of Chapter Four.
[1699] S 41 of the Constitution.
[1700] S 43 (9)-(10) & (12), S 45 (1) and S 46 (1) of the MPRDA.
[1701] S 14 (f) of NEMA.
[1702] S 22 (4) of the NWA.
[1703] DPME *Effective environmental governance in the mining sector* (2015) Policy Brief Series: Evidence for policy-making and implementation 2.
[1704] 3.

One of the issues affecting the effectiveness is poor coordination across relevant departments involved in the enforcement of environmental -water sustainability in the South African mining sector.[1705] Though the report does not highlight specifics for the less effective cooperative governance, it nonetheless indicates a lack of interdepartmental cooperation for environmental sustainability as a matter of concern.[1706] It also underlines that such lack of cooperation has resulted in poor implementation and enforcement of the environmental legal framework, thus, compromising the efficiency and ability of decisionmakers to promote environmental sustainability.[1707]

Recent court cases as analysed below support the findings of the above evaluation that lack of cooperation is causing poor legal implementation and enforcement regarding environmental governance in the South African mining sector. One such case is *Mining and Environmental Justice Community Network of South Africa and Others v Minister of Environmental Affairs and Others,*[1708] which exposed a failure to pursue water sustainability through good governance practices, including through cooperation as explained in Chapter Five of this thesis.[1709] The matter was brought before the High Court by a group of civil society and community organisations challenging the decision of the then Ministers of Mineral Resources and of Environmental Affairs, which permitted mining in a sensitive area.[1710] The applicants sought and successfully obtained a review and setting aside of the decision authorising coal-mining in the Mabola Protected Environment.[1711] One statement made in the judgment is that the state did not comply with cooperative governance required standard,[1712] as explained in Chapter Six.[1713] It emerged from the judgement that the Ministers failed to coordinate their actions in an effective manner, which led to decisions that undermined the provisions of PAJA concerning administrative action.[1714] In that regard, the Ministers acted in breach of section 6(2) of PAJA by

[1705] 2-3.
[1706] 2.
[1707] 2.
[1708] (50779/2017) [2018] ZAGPPHC 807.
[1709] See section 3.1 of Chapter Five of this thesis.
[1710] (50779/2017) [2018] ZAGPPHC 807, para 1.
[1711] (50779/2017) [2018] ZAGPPHC 807, paras 1, 14.1 & 14.2.
[1712] (50779/2017) [2018] ZAGPPHC 807, para 8.10.
[1713] See section 2 of Chapter Six of this thesis.
[1714] (50779/2017) [2018] ZAGPPHC 807, paras 8.10 & 8.12.

acting "procedurally unfair (…), failing to take relevant considerations into account and by taking irrelevant considerations into account".[1715] This contradicts the requirements for rational or just decision making as explained in Chapters Four and Six.[1716]

It also emerged from earlier attempts to appeal the decisions that the Minister of Mineral Resources had ignored the contradicting opinions arising from the Department of Water and Sanitation and conservation agencies.[1717] This also contradicts the theoretical and legal frameworks informing cooperation among state institutions, as explained in Chapters Five and Six of this thesis.

Another challenge in enforcing water protection in the mining sector through good governance emerged in *Mineral Sands Resources (Pty) Ltd v Magistrate for the District of Vredendal, Kroutz NO and Others*,[1718] where the shortcomings of cooperative governance for environmental protection are well highlighted. In this case, Mineral Sands Resources applied to the Court to have a search and seizure warrant obtained by the then Department of Environmental Affairs (DEA) set aside on the grounds that DEA lacks jurisdiction[1719] to enforce such a warrant.[1720] The DEA (without the collaboration of the then DMR) had obtained the search and seizure warrant for an investigation into numerous environmental crimes allegedly committed[1721] at the Tormin mineral sands mining operation on the West Coast.[1722]

The lack of collaboration between DEA and the DMR to investigate alleged environmental crimes as required by the Constitution[1723] raises a serious concern.[1724] In that particular instance, both departments were not pursuing a common purpose,

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[1715] (50779/2017) [2018] ZAGPPHC 807, paras 8.12.
[1716] See section 4.1.1 of Chapter Four and section 2 of Chapter Six of this thesis.
[1717] Para 11.5 CER *Appeal of the Decision by the Mpumalanga Department of Agriculture, Rural Development and Environmental Affairs to Grant Environmental Authorisation* (2017) <https://cer.org.za/wp-content/uploads/2017/08/CER_EA_appeal_submissions_FINAL.pdf.>; CER "Media Release: Civil society groups ask court to set aside mining right granted by Mining Minister in Mpumalanga protected area" (16-09-2015) <http://cer.org.za/news/media-release-civil-society-groups-ask-court-to-set-aside-mining-right-granted-by-mining-minister-in-mpumalanga-protected-area> (accessed 04-12-2015).
[1718] (18701/16) [2017] ZAWCHC 25.
[1719] Under the One Environmental System, in terms of S 31D(2A) of NEMA
[1720] (18701/16) [2017] ZAWCHC 25, para 1.
[1721] (18701/16) [2017] ZAWCHC 25, para 75.
[1722] (18701/16) [2017] ZAWCHC 25, para 72-73.
[1723] Chap 3 of the Constitution
[1724] N Ndlovu "Fragmented Approach to Governance? Critical Review of the Role Played by Various Government Departments and Agencies in the Administration of Heritage Matters in South Africa" (2016) 12 *Archaeologies* 281 294-295.

and even if they intended to, they failed to follow similar processes,[1725] as highlighted in Chapters Five and Six.[1726] The reason for such polarised pursuit of environmental protection probably lies in differing mandates of each department.[1727] It is, therefore, agreed that the current structure of the OES will not achieve its goal easily,[1728] as long as concerned departments fail to pursue common goals through similar processes.[1729]

Achieving water sustainability in the South African mining sector requires concerted contributions from the various departments concerned with environmental sustainability in the sector.[1730] Proper cooperation among government departments can only achieve effective environmental decision making if such departments implement and enforce the legal framework through similar processes and with common intentions.[1731]

Through successful cooperative governance, different parties are more likely to adhere to principles of accountability.[1732] When cooperating, concerned parties not only become each other's support but are also in a position to monitor and advise or correct when the other misses an essential point.[1733] Poor cooperative governance can hinder accountable administrative action in the pursuit of water sustainability. Accountability is discussed hereunder to highlight reasons for its failure to improve good environmental governance in the mining sector.

3 Accountability as a Performance Enabler for Water Protection

One important factor in analysing decision-making processes is the degree to which officials are held accountable for their decisions.[1734] Hence, accountability can serve

[1725] (18701/16) [2017] ZAWCHC 25, paras 79 & 84-85.
[1726] See section 3.1 of Chapter Five and section 2 of Chapter Six of this thesis.
[1727] S Esterhuyse, N Redelinghuys & M Kemp "Unconventional oil and gas extraction in South Africa: water linkages within the population–environment–development nexus and its policy implications" (2016) 41 *Water International* 409 411 & 419.
[1728] H Mostert & C Young *From Promise to Practice: South Africa's Legal Framework for Mineral Resources and the Sustainable Development Goals* (2018) SAIIA Occasional Paper 13-14.
[1729] (18701/16) [2017] ZAWCHC 25, paras 79 & 84-85.
[1730] Lund-Thomsen (2005) *International Affairs* 619 625.
[1731] See section 3.1 of Chapter Five of this thesis.
[1732] G Stoker "Public value management: A new narrative for networked governance?" (2006) 36 *The American Review of Public Administration* 41 47; E Choudhury & S Ahmed "The shifting meaning of governance: Public accountability of third sector organizations in an emergent global regime" (2002) 25 *International Journal of Public Administration* 561 563 & 565.
[1733] Kotzé "Environmental governance" in *Environmental Compliance and Enforcement in South Africa: Legal Perspectives* 122; S 41 of the Constitution.
[1734] Laver & Shepsle "Government accountability in parliamentary democracy" in *Democracy, Accountability, and Representation* 290.

as a performance enabler in decision-making processes, as explained in Chapter Five.[1735]

Government's mandates, as explained in Chapter Six of this thesis,[1736] are discharged through appointed officials such as ministers,[1737] as emphasised in *Minister for Environmental Affairs and Another v Aquarius Platinum (SA) (Pty) Ltd and Others*.[1738] The case exposes shortcomings in decision-making processes regarding the achievement of environmental sustainability. The case sought to establish whether the President's decision to publish an Act[1739] of parliament without regulations, was irrational.[1740] In addition to the Constitutional Court finding that the President did not act irrationally, it established that the then Minister of Environmental Affairs was to be blamed for not executing a mandate which was her responsibility.[1741]

The Court found that the Minister unreasonably failed to make available necessary regulations to put the Environmental Amendment Act[1742] into force.[1743] As a Minister, she ought to promote and ensure a safe environment for both the present and future generations,[1744] as explained in Chapter Three[1745] and in terms of the Constitution.[1746]

A minister and other state functionaries can also delegate specific tasks,[1747] to avoid failures like the one highlighted in this case. Other tasks relating to environmental protection include issuing an authorisation to carry out activities that are likely to impact the environment negatively.[1748] There are also tasks such as legal implementation and enforcement around issues such as water quality monitoring,[1749] and investigation.[1750]

[1735] See section 3.2 of Chapter Five of this thesis.
[1736] See section 2 of Chapter Six of this thesis.
[1737] S 3 of the NWA of 1998.
[1738] *Minister for Environmental Affairs and Another v Aquarius Platinum (SA) (Pty) Ltd and Others (CCT102/15) [2016] ZACC 4,* para 43.
[1739] National Environmental Management Laws Amendment Act 25 of 2014.
[1740] (CCT102/15) [2016] ZACC 4*,* para 1.
[1741] (CCT102/15) [2016] ZACC 4*,* para 31.
[1742] National Environmental Management Laws Amendment Act 25.
[1743] (CCT102/15) [2016] ZACC 4*,* para 41.
[1744] (CCT102/15) [2016] ZACC 4*,* para 43.
[1745] See section 2.2 of Chapter Three of this thesis.
[1746] See section 2 of Chapter Six of this thesis.
[1747] S 238(a) of the Constitution; S 6(2)(ii) of PAJA.
[1748] S 5A(a) of the MPRDA.
[1749] S 137 of the NWA.
[1750] S 35(5)(b).

Accountability, in the context of water protection, as explained in Chapter Five,[1751] should help to ensure that the actions, decisions and initiatives taken by decisionmakers are rational[1752] and thus, likely to meet the rationality test.[1753] Decisionmakers responsible for the promotion of water sustainability in the South African mining sector strive to ensure that requirements relating to the granting of environmental authorisations are observed.[1754] However, their actions sometimes fail to meet the level of accountability expected in terms of the legal framework. Such failure, as highlighted below, can be discussed at two levels: (1) the environmental authorisation level; and (2) the operational and closure levels.

3.1 Accountability in the Environmental Authorisation Process

As highlighted in Chapter Six, an environmental authorisation is a prerequisite for any mining project.[1755] Such authorisations are expected to ensure that mining projects do not hinder societal access to sustainable water resources.[1756] Water sustainability is to be achieved through processes such as environmental impact assessments (EIA) and environmental management program (EMPr).[1757]

Notwithstanding how challenging the environmental authorisation process may be,[1758] the decisionmaker may not make decisions that are disastrous for the environment and water resources.[1759] Therefore, decisionmakers must apply good governance principles, such as accountability during the environmental authorisation process.[1760] Accountable actions during the environmental authorisation process can avoid or limit the adverse effects of mining on water resources far better than it could at a later phase of mining.[1761] However, as highlighted below, it is obvious that decisionmakers are not held to account when it comes to environmental protection in general.

[1751] See section 3.2 of Chapter Five of this thesis.
[1752] Feris (2010) *PELJ* 74.
[1753] See section 4.1.1 of Chapter Four of this thesis.
[1754] (7655/05, 7655/05) [2006] ZAGPHC 47, para 2.
[1755] See section 3.1.1 of Chapter Six of this thesis.
[1756] C Wood "Pastiche or postiche? Environmental impact assessment in South Africa" (1999) 81 *South African Geographical Journal* 52 52.
[1757] See sections 3.1.2 & 3.1.3 of Chapter Six of this thesis. See also S 24(5)(bA)(iii) of NEMA; S 24G(1)(b)(vii)(ee) of NEMA.
[1758] See shortcomings of the legal framework discussed in Chapter Seven.
[1759] (50779/2017) [2018] ZAGPPHC 807, para 4.11.3.
[1760] Feris (2010) 13 *PELJ* 74.
[1761] See section 3.1.1 of Chapter Six of this thesis.

Decisionmakers are criticised for granting environmental authorisation for mining projects in areas where mining will cause further water pollution.[1762] This is contrary to legal provisions for decision-making to protect water resources,[1763] and for administrative action to only take place where such action is "reasonable and justifiable".[1764]

The rate of mine-related water pollution is, to some extent, an indication that some mining activities are or have taken place in areas where they should not have been authorised in the first place.[1765] This notwithstanding, the Department of Mineral Resources and Energy continues to grant authorisations under questionable circumstances discussed below, thus lacking accountability in environmental protection processes.[1766]

Regarding legally promoting water sustainability through good governance, the *Mining and Environmental Justice Community Network of South Africa and Others v Minister of Environmental Affairs and Others* case discussed above paints a good picture of poor accountability. One main concern advanced by the applicants was that the area is protected and mostly made up of wetland.[1767] Also, amongst others, the area is a source of three rivers that are likely to be polluted, should mining take place in the area.[1768] These concerns indicate that some critical decision-making processes were not properly observed,[1769] and the authorisation cannot be perceived as accountable, thus, meeting the rationality test,[1770] since there is no reasonable justification.[1771]

As argued by the applicants, the grounds on which an environmental authorisation was granted for the mining project in the area raise concerns regarding the level of accountability by the then Minister of Mineral Resources.[1772] By setting aside the decision of the Ministers of Mineral Resources and Environmental Affairs, the judge

[1762] A Paterson "Protected areas law, mining and the principle of non-regression–a South African perspective" (2017) 23 *SAJELP* 142 148.
[1763] S 24(b) of the Constitution. See also EIA Regulations.
[1764] S 5(3) and (4) of PAJA. See also section 2 of Chapter Six of this thesis.
[1765] McCarthy (2011) 107 *S. Afr. J. Sci* 5.
[1766] Leonard & Lebogang (2018) *Sustainable Development* 211-212.
[1767] (50779/2017) [2018] ZAGPPHC 807*,* para 1*.*
[1768] B South "Cheers as brakes put on coal mining In vital water source of Mabola in Mpumalanga" (2017) *SABI* 31.
[1769] Leonard (2017) *JEAPM* 9.
[1770] See section 4.1.1 of Chapter Four of this thesis.
[1771] (50779/2017) [2018] ZAGPPHC 807*,* para 11.2*.*
[1772] (50779/2017) [2018] ZAGPPHC 807*,* para 8*.*

pointed to the fact that the Ministers failed to consider the impacts of listed activities[1773] triggered by the proposed project.[1774] For example, despite the provisions of the EIA Regulations,[1775] the Ministers overlooked an assessment of the adverse impacts of the proposed project on societal[1776] and environmental rights.[1777] It, therefore, means that in terms of NEMPAA,[1778] the ministers failed to consider relevant factors like risk when granting the environmental authorisation.[1779] Such irrational action is inconsistent with the precautionary principle explained in Chapter Three which requires a cautious approach anticipating possible adverse impacts of planned projects.[1780]

A failure to consider key factors leads to the conclusion that the decisionmaker's action was irrational and therefore, an indication of poor governance.[1781] Such failure raises concerns relating to accountability as there does not seem to be proper justification for the decision to grant the environmental authorisation.[1782] As mentioned in Chapter Six,[1783] no mining activity may be conducted in a protected environment[1784] as mining is a permanent threat to water resources in such areas.[1785]

In the context of the South African mining sector, accountability in environmental and water protection is established under the existing legal framework. Both the MPRDA[1786] and NEMA[1787] advocate for administrative decision-making processes to be lawful, reasonable and procedurally fair as provided for under PAJA.[1788] The MPRDA further provides that the responsibility to implement environmental

[1773] Listed in the NEMA Listing Notices: Environmental Impact Assessment Regulations Listing Notices 1, 2 and 3 of 2014.
[1774] (50779/2017) [2018] ZAGPPHC 807*,* para 4.11.3*.*
[1775] Regulation 3 of the EIA Regulations of 2014.
[1776] Economic, cultural and social rights.
[1777] (50779/2017) [2018] ZAGPPHC 807*,* para 8.7 & 11.7*.*
[1778] S 48(4) of NEMPAA.
[1779] (50779/2017) [2018] ZAGPPHC 807*,* para 11.8.3*;* See also CER *Appeal of the Decision by the Mpumalanga Department of Agriculture, Rural Development and Environmental Affairs to Grant Environmental Authorisation*.
[1780] See section 3.3 of Chapter Three of this thesis.
[1781] S 6(2)(f)(ii) of PAJA.
[1782] (50779/2017) [2018] ZAGPPHC 807*,* para 11.2*.*
[1783] See section 3 of Chapter Six of this thesis.
[1784] S 48(1)(b) of the NEMPAA.
[1785] Clevenger (1990) *Water, Air, and Soil Pollution* 241.
[1786] S 6 of the MPRDA.
[1787] S 1(5) of NEMA.
[1788] S 3 and 6 of PAJA.

protection[1789] in the mining sector is the responsibility of the Minister of Mineral Resources, implying that the Minister is accountable for decision making in that regard.[1790]

For purposes of accountability relating to water protection, in particular, the NWA stresses that the Minister of Water and Sanitation, acting on behalf of the national government as the trustee of South Africa's water resources, is responsible for ensuring water protection.[1791] The Minister has the mandate to protect, manage and control the country's water resources, and should, therefore, be held accountable if such mandate is not executed sustainably and equitably.[1792]

Without accountability, as provided in the legal framework,[1793] there is very likely to be instances of poor decision-making in connection with water sustainability at the planning phase of mining sector.[1794] For environmental authorisations to achieve their aim, decisionmakers must be mindful of their role in administrative actions.[1795] Decisionmakers as public functionaries are accountable for any action taken in the public interest and which action has the potential to affect people's life.[1796]

However, a rational decision or action may still result in some negative and unintended consequences.[1797] Nonetheless, this thesis argues that public functionaries must always strive to be accountable when granting environmental authorisations as well as enforcing water sustainability beyond the planning phase of mining. For that reason, public bodies responsible for water sustainability in the mining sector are still accountable for water protection in the other phases of mining, as discussed in the next section.

3.2 Accountability for Water Protection Beyond the Environmental Authorisation Process

Environmental authorisations are an essential process in a mine's life cycle where decisionmakers must determine whether a proposed project is sufficiently

[1789] In terms of NEMA. See also S 38A of the MPRDA
[1790] S 38A of the MPRDA.
[1791] S 3(1) of the NWA.
[1792] S 3(1).
[1793] See section 2 of Chapter Six of this thesis. See also S 2-5 of PAJA.
[1794] Leonard & Lebogang (2018) *Sustainable Development* 211-212.
[1795] Alberts et al. (2017) *The Extractive Industries and Society* 273.
[1796] Weiss (2000) *Third World Quarterly* 805.
[1797] Dryzek (1987) *Political Studies* 424 & 437.

environmentally sustainable to be permitted.[1798] It is also at this stage that decisionmakers can be proactive and stop any future water pollution caused by mining.[1799]

However, even when mining and environmental authorisations are granted following good governance processes, decisionmakers are responsible for ensuring that the legal provisions[1800] relating to such authorisations are properly implemented and enforced beyond the authorisations. Decisionmakers' actions in this regard will be perceived as lacking effectiveness and efficiency if they fail to ensure proper implementation and enforcement of laws seeking water sustainability.[1801]

In terms of NEMA and PAJA, accountable decision making regarding the implementation and enforcement of the legal framework is when mandates are performed as required by legislation.[1802] In terms of implementation and enforcement of good environmental governance, accountability is necessary to ensure that decisionmakers perform in ways that are beneficial to stakeholders. Thus, as highlighted in Chapter Six,[1803] officials responsible for the enforcement of water sustainability during mine operations are required to monitor mining companies in terms of legal compliance.[1804] Following monitoring, they must ensure that mining companies which flout the law are held responsible as required by NEMA.[1805] In so doing the polluter-pays principle[1806] would be enforced through (effective) administrative action that is likely to be rational, and thus, accountable.[1807]

For purposes of mine closure and rehabilitation, accountable decision making in administrative action is that which is effective in ensuring that mines are closed and rehabilitated properly as provided in the MPRDA and NEMA.[1808] As required by these

[1798] See section 3.1.1 of Chapter Six of this thesis.
[1799] AR Mareddy, A Shah & N Davergave *Environmental Impact Assessment: Theory and Practice* (2017) 217.
[1800] Ss 31D(4) & 50A(2)(b) of NEMA.
[1801] See section 4.3 of Chapter Four of this thesis.
[1802] S 2(4)(v) of NEMA; Ss 6(2)(h) & 10A of PAJA.
[1803] See section 3.1.1.3 of Chapter Six of this thesis.
[1804] Point 1(h) & (i), Appendix 4 of the EIA Regulations of 2014.
[1805] S 28 of NEMA.
[1806] As explained in section 3.2.1 of Chapter Six.
[1807] ET Larson "Why environmental liability regimes in the United States, the European Community, and Japan have grown synonymous with the polluter pays principle" (2005) 38 *Vand. J. Transnat'l L.* 541 551-552.
[1808] S 43(7) of the MPRDA and S 24N(7)(e) & 24R(1) of NEMA.

legislation, decisionmakers must ensure that mining companies set aside funds from the outset for rehabilitation.[1809] Where mining companies fail to rehabilitate mine sites upon closure, the government as per its constitutional mandate[1810] is required to use the said funds to rehabilitate the site.[1811]

Regarding water protection in the South African mining sector, the government has since 1991 multiplied its efforts to safeguard one of the nation's scarce resources, that is water.[1812] Today, state officials attempts to implement and enforce the environmental legal framework in the mining sector are very significant.[1813] However, such attempts, as explained below, often fail to achieve their intended goals due to gross lack of accountability and incompetence in environmental decision making.

3.2.1 Gross Lack of Accountability in Decision-Making

In theory, the environmental legal framework - even with some shortcomings[1814] -is appropriate to promote aspects of good governance such as accountability in the mining sector.[1815] However, in practice, the legal framework is not well implemented and enforced.[1816] Legislation, therefore, loses its effectiveness due to inadequate enforcement.[1817] For instance, illegal mining activities occur in various areas for various reasons, including lack of regular site monitors as required in terms of NEMA.[1818] In such instances, amongst others, government officials, in their role as decisionmakers, are seen as not performing their duties properly in terms of promoting environmental sustainability in the mining sector.[1819]

In the Mineral Sands Resources case mentioned above, the decision of the High Court highlighted a gross lack of accountability on the part of the DMR.[1820] Following Mineral

[1809] S 89 of the MPRDA and S 24P of NEMA.
[1810] See section 2 of Chapter Six of this thesis.
[1811] S 24P(2) of NEMA.
[1812] T Madihlba "The fox in the henhouse: The environmental impact of mining on communities in South Africa" in DA McDonald (ed) *Environmental Justice in South Africa* (2002) 160.
[1813] D Atkinson "Fracking in a fractured environment: Shale gas mining and institutional dynamics in South Africa's young democracy" (2018) 5 *The Extractive Industries and Society* 441 447 & 449.
[1814] As discussed in Chapter Seven of this thesis.
[1815] See section 3 of Chapter Six of this thesis.
[1816] L Leonard "Mining corporations, democratic meddling, and environmental justice in South Africa" (2018) 7 *Social Sciences* 1 2.
[1817] 5.
[1818] S 31D(2A) of NEMA.
[1819] (18701/16) [2017] ZAWCHC 25, paras 79 & 84-85.
[1820] (18701/16) [2017] ZAWCHC 25, para 161-163.

Sands Resources application to have the DEA's search and seizure warrant set aside,[1821] the Court found that the DEA had partly overstepped its jurisdiction.[1822] Nonetheless, the Court stated that it was not persuaded by Mineral Sands Resources that the alleged illegal activities being investigated were indeed lawful as supported by the DMR.[1823] Thus, the Court underlined that the DMR was wrong in assuming that a breach of environmental provisions was not wrong.[1824] The position of the Court confirms that the DMR is either not doing enough monitoring or failed to monitor the breach of environmental protection requirements to realise that Mineral Sands Resources failed in terms of compliance.[1825]

The above case, amongst others, highlights a shortcoming of administrative action in terms of accountable decision making.[1826] One reason for poor administrative action is administrative lack of capacity within the DMRE to handle the challenges of implementing and enforcing environmental aspects such as water protection in the mining sector effectively.[1827] Poor accountability regarding the promotion of environmental aspects such as water sustainability is also explained by reasons such as poor and unethical administrative action practices,[1828] which occur due to incompetence, as explained below.

3.2.2 Incompetency of Decisionmakers

There are instances where officials have failed in their duty to pursue water sustainability due to their inability to demonstrate rational administrative action. Such inability is at times due to the incompetence of decisionmakers who fail to understand and stick to that which is required of them,[1829] as explained in Chapters Four.[1830]

During a 2018 case study by Leonard et al., corruption came up as one reason why mining was damaging the environment around the Mapungubwe Heritage Site in

[1821] In terms of S 31D(2A) of NEMA.
[1822] (18701/16) [2017] ZAWCHC 25, para 222.
[1823] (18701/16) [2017] ZAWCHC 25, para 219-220.
[1824] (18701/16) [2017] ZAWCHC 25, para 161-163.
[1825] S 24 of NEMA; (18701/16) [2017] ZAWCHC 25, para 163.
[1826] (50779/2017) [2018] ZAGPPHC 807, para 8.
[1827] Forrest & Loate (2018) *The Extractive Industries and Society* 160.
[1828] 156.
[1829] IM Ambe & JA Badenhorst-Weiss "Procurement challenges in the South African public sector" (2012) 6 *Journal of Transport and Supply Chain Management* 242 243 & 251.
[1830] See section 4 of Chapter Four of this thesis.

Limpopo, to the detriment of tourism and farming.[1831] The term "corruption" was mainly used in relation to the mining company involved trying to bribe some community members in accepting the mining development.[1832] The study does not say whether the government was aware of such corruption and what its reaction was. Considering the government's unreliable attitude towards the community, it is unlikely that community members would have deemed it necessary to approach the government with such corruption claims.[1833]

During the study, some interviewees indicated that the government's attitude towards environmental protection was concerning as government officials were rather trying to manipulate them into accepting the mine.[1834] This despite community's concerns about environmental degradation.[1835] One interviewee also maintained that to prioritise mining; officials made it a political matter, hence, claiming that the land was theirs.[1836]

The findings of the study show that government officials involved in mining in that area were incompetent as they failed to promote mining through legal avenues as explained in Chapter Six.[1837] Rather, they neglected their constitutional environmental mandate towards the environment and vulnerable communities, as explained in Chapter Six above[1838] and pressurised the concerned community through illegal means to approve the mining project. This thesis argues that this level of incompetency undermines accountability in administrative decision-making processes towards achieving water sustainability in the South African mining sector, and thus contradicts Batho Pele discussed in Chapter Five.[1839]

The ability of an official to be accountable in instances like the above can be enhanced through transparent actions.[1840] The following section discusses transparency and

[1831] Leonard & Lebogang (2018) *Sustainable Development* 213.
[1832] 213.
[1833] 211.
[1834] 214.
[1835] 210.
[1836] 213.
[1837] See sections 2 and 3 of Chapter Six of this thesis.
[1838] See sections 2 of Chapter Six of this thesis.
[1839] See section 3.2.2 of Chapter Five of this thesis.
[1840] Harrison & Sayogo (2014) *Government Information Quarterly* 513.

access to information as factors without which the enforcement of water sustainability in the South African mining sector can be impeded.

4 Transparency and Access to Information

As explained in Chapters Five and Six, transparency and access to information are pillars of good governance with the potential to improve accountable decision making.[1841] For instance, transparency and access to information play an important role in allowing various stakeholders access to information useful to judge decisionmakers' performance.[1842]

Transparency and access to information requirements[1843] relating to administrative decision-making should urge decisionmakers to make available information on their actions and processes relating thereto,[1844] especially where other stakeholders are likely to be affected.[1845] Through transparency and access to information, the reasonableness and lawfulness, thus the rationality of specific actions, should be established.[1846] Therefore, transparency should be able to promote accountability because it allows stakeholders to hold decisionmakers accountable.[1847] This has the potential to promote water sustainability in the mining sector through decision-making processes, as explained in Chapter Five above.[1848]

Amongst others, transparency and access to information seem to be an issue in instances of water protection.[1849] Despite the government being required to make available information relating to different mining licences and authorisations,[1850] there are instances of non-compliance by the DMRE.[1851] For example, an authorisation for

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[1841] As discussed under sections 3.2.1 of Chapter Five and 3.1.1.1 & 3.1.1.2 of Chapter Six of this thesis.
[1842] Grimmelikhuijsen (2010) *Policy & Internet* 13.
[1843] S 32 of the Constitution; Preamble to PAIA.
[1844] J Fairbanks, KD Plowman & BL Rawlins "Transparency in government communication" (2007) 7 *Journal of Public Affairs* 23 25.
[1845] JE Relly & M Sabharwal "Perceptions of transparency of government policymaking: A cross-national study" (2009) 26 *Government Information Quarterly* 148 149.
[1846] Relly & Sabharwal (2009) *Government Information Quarterly* 149.
[1847] Fairbanks et al. (2007) *Journal of Public Affairs* 24; Relly & Sabharwal (2009) 26 *Government Information Quarterly*" 149.
[1848] See section 3.2.1 of Chapter Five.
[1849] J Yeld "GroundUp: Prospect of mining on Olifants River estuary alarms fishermen" (28-05-2018) <https://www.dailymaverick.co.za/article/2018-05-28-groundup-prospect-of-mining-on-olifants-river-estuary-alarms-fishermen/> (accessed 24-07-2019).
[1850] S 32(1) of the Constitution.
[1851] Colvin et al. *Coal and water futures in South Africa:* 77; Leonard (2017) *Politikon* 328.

prospecting issued by a regional manager of the then DMR came as a surprise to "interested and affected parties".[1852] An attempt[1853] to obtain information relating to a final assessment report concerning prospecting on the northern bank of the Olifants River estuary had proved unsuccessful.[1854] The report was only released after an application was made by the interested and affected parties to the DMR regional department, in terms of the PAIA.[1855] The application, which was lodged 14 months after the same information was requested from the department, eventually yielded results only six days prior to the prospecting approval by the department.[1856]

The above suggests that the approval process was flawed as information was not released timeously. The information was made available with very little time for interested and affected parties to make a meaningful impact regarding prospecting on one of the healthiest estuaries in South Africa.

As per the discussion in Chapter Six, the above scenario is inconsistent with PAIA, which requires that a request for access must be granted to information held by a public body.[1857] The scenario would have been rational in an instance where such access was refused according to PAIA based on grounds on which access to information may be refused.[1858] That the Department released the final assessment report, just before signing the authorisation for prospecting did not allow the counterpart community sufficient time to comment, and in this way undermined the consultation process.[1859] This incident suggests that the DMRE does not always ensure proper dissemination of records.[1860]

A 2009 report of the Auditor-General and a recent parliamentary report indicate that the DMRE's database does not always include all the data as expected and therefore, is not up to the required standards.[1861] The DMRE has also been accused of having a

[1852] Yeld "GroundUp: Prospect of mining on Olifants River estuary alarms fishermen".
[1853] By a member of the Olifants Estuary Management Forum.
[1854] Yeld "GroundUp: Prospect of mining on Olifants River estuary alarms fishermen".
[1855] Yeld "GroundUp: Prospect of mining on Olifants River estuary alarms fishermen".
[1856] Yeld "GroundUp: Prospect of mining on Olifants River estuary alarms fishermen".
[1857] See section 3.1.1.1 of Chapter Six of this thesis. See also S 8 of PAIA.
[1858] Ch 3 of 4 of PAIA.
[1859] Armstrong *Integrity, Transparency and Accountability in Public Administration:*1-2.
[1860] Leonard (2017) *JEAPM*" 2-3.
[1861] AGSA "Report of the Auditor-General to Parliament on a Performance Audit of the Rehabilitation of Abandoned Mines at the Department of Minerals and Energy" (2009) 7; Parliament of the Republic of South Africa "Report of the Portfolio Committee on Mineral Resources on its activities undertaken during

culture of secrecy which cannot be defended legally.[1862] In defence of decisionmakers, it is assumed that in certain cases the purpose of secrecy is to protect the interests of permits and licences' applicants.[1863] Such secrecy does not help the promotion of water sustainability.[1864] The secrecy may enable the concealment of environmental crimes because other departments or organisations may lack the accurate information necessary to determine when an environmental crime is being committed.[1865] Concealing information relating to environmental crime is inconsistent with PAIA, which provides for access to protected or confidential records with regard to matters of public interest such as environmental risk.[1866]

The information discussed above is critical in the EIA process as it helps to ensure that in determining environmental authorisations, all issues relevant to water protection in the mining sector, are considered.[1867] Lack of transparency in an EIA process is a serious challenge to effective accountability in the mining sector, and thus, good environmental governance.[1868]

Limited or no access to information also hampers effective public participation as a lack of transparency is an obstacle to productive involvement of interested and affected parties in decision-making processes.[1869] The following analyses the effectiveness of public participation in the enforcement of water sustainability in the South African mining sector

5 Limited Public Participation in Environmental Decision-Making

Vulnerable communities are very often the most affected by the impacts of mining, such as water pollution.[1870] For that reason, it is necessary to involve communities or

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the 5th Parliament (May 2014 – March 2019)" (2019) 2 <http://pmg-assets.s3-website-eu-west-1.amazonaws.com/Adopted_PC_Mineral.pdf> (accessed 24-07-2019).

[1862] Leonard (2017) *JEAPM* 3.

[1863] Kengni "Intergovernmental relations: One Environmental System" in *Co-ordinating Governance for Mining: Streamlining Systems for Improved Intergovernmental Relations* 47.

[1864] D Hallowes & V Munnik *The destruction of the highveld part 1: Digging coal* (2016) *GroundWork Report* 26.

[1865] Hallowes & Munnik *The Destruction of the Highveld Part 1:*.

[1866] S 46(a)(ii) of PAIA.

[1867] Leonard & Lebogang (2018) *Sustainable Development* 211-212.

[1868] Leonard (2017) *JEAPM* 2; O Nadeem, R Hameed & S Haydar "Public consultation and participation in EIA in Pakistan and lessons learnt from international practices" (2016) 14 *Pakistan Journal of Engineering and Applied Sciences* 73 79.

[1869] Eden (2016) *Public Understanding Of Science* 184.

[1870] See section 2.1.3 of Chapter Two of this thesis.

affected members of society in decision making relating to issues affecting them or their wellbeing,[1871] as required by the legal framework.[1872] Public participation is identified in this thesis as an important feature of good environmental governance, and one which can promote accountability in an administrative action relating to the pursuit of water sustainability.[1873]

Generally, public participation refers to the process by which interested and affected parties or stakeholders are consulted during a decision-making process.[1874] Community consultation, in particular, should, therefore, aim at ensuring that vulnerable members of society are consulted in decisions relating to issues affecting or likely to affect them.[1875] Effective public participation should include communication and collaboration between concerned parties to arrive at a decision that is likely to suit each party involved.[1876] Thus, in compliance with the Batho Pele,[1877] public participation processes are required to provide a platform for members of society, especially communities vulnerable to the adverse impacts of a mining project to express their concerns regarding the possible impacts of a project on water resources.[1878]

Though public participation has the potential to promote accountability,[1879] existing facts suggest that it is not properly promoted in environmental decision-making regarding water sustainability in the South African mining sector.[1880] In a matter still subject to the decision of an internal appeal [1881] the former DMR granted prospecting rights for coal to Commissiekraal Coal - Bright Coal on a property in the Utrecht district

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[1871] PD Smith & MH McDonough "Beyond public participation: Fairness in natural resource decision making" (2001) 14 *Society & Natural Resources* 239 241, 243-244.
[1872] AN Glucker, PPJ Driessen, A Kolhoff & HAC Runhaar "Public participation in environmental impact assessment: why, who and how?" (2013) 43 *Environmental Impact Assessment Review* 104 105.
[1873] JL Creighton *The Public Participation Handbook: Making Better Decisions Through Citizen Involvement* (2005) 108-109.
[1874] A Fung "Putting the public back into governance: The challenges of citizen participation and its future" (2015) 75 *Public Administration Review* 513 521. See also See section 3.2.2 of Chapter Five of this thesis.
[1875] T Nabatchi & M Leighninger *Public Participation for 21st Century Democracy* (2015) 124.
[1876] Nabatchi & Leighninger *Public Participation for 21st Century Democracy* 156.
[1877] See section 3.2.2 of Chapter Five of this thesis.
[1878] X Wang & M Wan Wart "When public participation in administration leads to trust: An empirical assessment of managers' perceptions" (2007) 67 *Public Administration Review* 265 269; Glucker et al. "Public participation in environmental impact assessment: why, who and how?" 105.
[1879] As argued in section 3.2.2 of Chapter Five of this thesis.
[1880] Leonard (2017) *JEAPM* 2.
[1881] CER "Bright Coal-Commisiekraal" <https://cer.org.za/wp-content/uploads/2011/12/Bright-Coal-Commisiekraal.pdf> (accessed 07-09-2018).

in KwaZulu-Natal. The said property is situated in the water catchment area of the Pongola River, which provides water to more than 150 000 people downstream.[1882] Letters of objection[1883] were submitted to the DMR to overturn prospecting rights for various reasons, including lack of proper consultation with all interested and affected parties.[1884]

Though the owner of the property was consulted and was willing to facilitate prospecting, interested and affected parties located downstream only became aware of the project when activities were about to begin.[1885] In its defence for granting the prospecting rights, the then Minister of Mineral Resources argued and claimed that "no objection" was received after approaching other departments for comment.[1886]

It, however, appeared that a concerned party like WWF that might have strongly contested the decision-making relating to the mining project was excluded from the consultation process.[1887] It is alleged that a letter, written by a representative of WWF and addressed to Commissiekraal Coal - Bright Coal never reached its destination,[1888] for reasons yet to be clarified.

This case raises some similar issues as those raised in the *Bengwenyama case* (discussed in Chapter Seven of this thesis)[1889] where the Court found that the administrative action in granting a prospecting right was flawed.[1890] The Court also found that communities and affected parties right to be consulted was flouted.[1891]

These cases raise issues of rationality relating to the manner in which the Minister dealt with the aspect of public participation in reaching his decision. In terms of NEMA and the EIA Regulations, the Minister is supposed to ensure that all interested and affected parties are granted a fair opportunity to communicate their opinions.[1892] In Commissiekraal, there was a strong need for the DMR to apply itself, yet it does not

[1882] Colvin et al. *Coal and water futures in South Africa:* 72.
[1883] From the Greater Pongola River Catchment Protection Association, WWF and Impala Water Users Association. See CER "Bright Coal-Commisiekraal".
[1884] Colvin et al. *Coal and water futures in South Africa:* 72.
[1885] CER "Bright Coal-Commisiekraal".
[1886] Colvin et al. *Coal and water futures in South Africa:* 72.
[1887] 72.
[1888] CER "Bright Coal-Commisiekraal".
[1889] See section 3.1.2 of Chapter Seven of this thesis.
[1890] (CCT 39/10) [2010] ZACC 26, para 84.
[1891] (CCT 39/10) [2010] ZACC 26, para 13.
[1892] S 24(4)(v) of NEMA; Regulation 40(1)(b) & (2)(d) of the EIA Regulations of 2014.

appear to be the case. Similarly, with regard to the tests for rationality, it would have been rational in this instance for the DMR to consider what appears to be valid concerns,[1893] given that the area in question is a sensitive one.

There are also instances where decisionmakers have been sued for failing or not properly enforcing public participation with respect to decision-making processes relating to water protection. Two recent matters brought before the water tribunal on appeal have highlighted a lack of public participation for purposes of decision-making relating to the promotion of water sustainability in the mining sector. In *Escarpment Environment Protection Group and another v Director-General: Department of Water and Sanitation and others*[1894] the appellants appealed against the water use licence (WUL)[1895] granted to the second respondent[1896] by the first respondent.[1897] The appellants[1898] submitted that though consultation with interested and affected parties had occurred, WUL never formed part of the consultation process.[1899] They further argued that the first respondent[1900] had neglected its duty and thus failed to use its discretion to request the second respondent[1901] to conduct a comprehensive public participation process as required under the NWA.[1902] The NWA requires the responsible authority[1903] to "invite written comments" from any person interested in matters relating to licence applications for water use.[1904]

The hearing focused on the question as to whether the appellants had *locus standi* to lodge the appeal given that they never submitted any form of objection as provided in the NWA.[1905] The appellants argued in their defence that they only learnt about and obtained a copy of the WUL more than two years after it was granted.[1906] However,

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[1893] In terms of Regulation 21(1) of the EIA Regulations of 2014. See also O'Faircheallaigh (2010) *EIA Review* 19.
[1894] *Escarpment Environment Protection Group and another v Director-General: Department of Water and Sanitation and others (WT 03/17/MP) [2017].*
[1895] Licence No: 05/X11D/AGJ/1583.
[1896] Analisa Mining Industrial Services CC.
[1897] Director-General: Department of Water and Sanitation. See *Escarpment Environment Protection Group and another,* para 1.
[1898] Escarpment Environment Protection Group and Wonderfontein Community Association.
[1899] *(*WT 03/17/MP) [2017], para 2 & 4.
[1900] Director-General of Department of Water and Sanitation.
[1901] Analisa Mining Industrial Services.
[1902] *(*WT 03/17/MP) [2017], para 8.
[1903] Department of Water and Sanitation in this case, represented by its Director-General.
[1904] S 41(2)(c) of the NWA.
[1905] S 148(1)(f); (WT 03/17/MP) [2017], para 14.
[1906] (WT 03/17/MP) [2017], para 20.4.

the Tribunal dismissed the appeal because the appellants failed to make a written objection against WUL.[1907] Despite dismissing the appeal, the Tribunal recognised that procedural issues such as participation raised in this case are important and may be valid.[1908]

In *West Coast Environmental Protection Association v Minister: Department of Water and Sanitation and others* where an appeal was lodged with a delay of two days and the Water Tribunal condoned the delay.[1909] The Tribunal noted that the appellants were only served with a copy of the WUL two days before lodging their appeal; which days fell on a Saturday and Sunday.[1910] In its decision, the Tribunal further indicated that the facts of the appeal showed prospects of success.[1911] The Court found that there were prospects of success because the grounds of appeal were "bona fide and raised a *prima facie* case".[1912] The prospects of success result from the argument by the appellants that the public participation process was flawed and that from the outset they were hindered from participating meaningfully in the decision-making process.[1913]

The above cases indicate that the participation of interested and affected parties in environmental -water decision-making processes is either absent or limited. Absent and limited participation suggests that the role of interested and affected parties in the promotion of good environmental governance is undermined.[1914]

To some extent, little or no participation explains why communities and civil societies are taking decisionmakers to court.[1915] Hence, Court decisions help to enforce the affected and concerned parties' rights to have a say in issues such as water protection in which they have a direct interest or are affected by them.[1916] As highlighted in

[1907] (WT 03/17/MP) [2017], para 32.
[1908] (WT 03/17/MP) [2017], para 23 and 31.
[1909] *West Coast Environmental Protection Association v Minister: Department of Water and Sanitation and others (WT 01/17/WC) [2017],* para 45.4.
[1910] (WT 01/17/WC) [2017], para 45.1.
[1911] (WT 01/17/WC) [2017], para 45.3.
[1912] (WT 01/17/WC) [2017], para 45.3.
[1913] (WT 01/17/WC) [2017], para 15.
[1914] (133/98) [1999] ZASCA 9, para 20; Leonard (2017) *JEAPM* 18.
[1915] SAHRC *National Hearing on the Underlying Socio-economic Challenges of Mining-affected Communities in South Africa* (2018) 60 & 70.
[1916] See cases mentioned in this section. See also SAHRC *National Hearing on the Underlying Socio-Economic Challenges of Mining-affected Communities* 70.

Chapter Six, public participation is designed to enforce decisionmakers' accountability regarding water protection in the mining sector.[1917]

Absent and limited participation is also an indication that decisionmakers are failing to make reasonable decisions and to exercise fair administrative action as required by PAJA.[1918] Reasonable and fair administrative action can contribute to the promotion of effective decision-making processes. The following section discusses the degree of effectiveness of environmental decision making as the basis of good environmental governance in the South African mining sector.

6 Effectiveness of Decision Making for Water Sustainability

Decision making is central to the control of water pollution caused by mining. Hence, to deal with water pollution successfully, decision making must be effective to serve the purposes of good environmental governance.[1919] Effectiveness in this context requires the administration to have or develop the ability to make decisions or take actions that are capable of achieving water sustainability in the mining sector.[1920] Such decisions and actions must be reasonable and in the best interest of all, including future generations.[1921] As required by PAJA, administrative action must be required and for a purpose, to be seen as "reasonable and justifiable".[1922] The likely effects of such action on the public must also be taken into account.[1923] Administrative action aimed at water sustainability in the mining sector would lack effectiveness if it lacks responsiveness and efficiency as discussed in the sections that follow, to meet the requirement of PAJA.

6.1 Responsiveness in Decision-Making

Responsiveness, as explained Chapter Five,[1924] is needed in the pursuit of good environmental governance. The ability of a given system to perform effectively depends, to some extent, on how responsive the main actors or components of the

[1917] See section 3.1.1.1 of Chapter Six of this thesis.
[1918] S 3(3) and 4 of PAJA.
[1919] See section 3.3 of Chapter Five of this thesis.
[1920] Poff et al. (2003) *Frontiers in Ecology and the Environment* 301.
[1921] I Currie, J De Waal & Law Society of South Africa *The Bill of Rights Handbook* 6th ed (2013) 528; Poff et al. (2003) *Frontiers in Ecology and the Environment* 301.
[1922] S 3(4)(b)(ii) of PAJA.
[1923] S 3(4)(b)(iii) & (iv).
[1924] See section 3.3 of Chapter Five of this thesis.

system are, as explained in Chapter Five.[1925] Responsive decisionmakers or institutions should be able to discharge given duties in a manner that is beneficial to society and within a reasonable timeframe.[1926] A responsive administrative action should be one that takes into consideration the interest of citizens and is capable of impacting them positively.[1927] Thus, a responsive decisionmaker or administrator is one who can deliver satisfactorily and timeously.[1928]

Responsive decision-making has the potential to promote legal implementation and enforcement efficiently since decisionmakers in that regard are likely to provide positive outputs to other stakeholders or affected and concerned communities.[1929] In so doing, good environmental governance is promoted.[1930] Good governance can, therefore, be achieved when institutions and processes serving the interests of all stakeholders produce positive results within a reasonable timeframe.[1931]

For purposes of environmental sustainability, a responsive institution must respond or react to issues of water pollution control in the mining sector and make decisions timeously. As provided by NEMA, the Director-General with the DMRE has the authority to make decisions regarding timely reparation of environmental damage.[1932] In that regard, the Director-General is allowed to direct persons who have caused or are likely to cause environmental pollution to cease non-environmental-friendly activities,[1933] and take measures to ensure environmental protection by a specific time.[1934] The said directive is necessary where urgent action is needed to ensure environmental sustainability.[1935]

[1925] See section 3.3 of Chapter Five of this thesis.
[1926] Vigoda (2002) *Public Administration Review* 528, 532-538.
[1927] Peter L Strauss "Revisiting Overton Park: Political and Judicial Controls Over Administrative Actions Affecting the Community" (1991) 39 *UCLA L. Rev.* 1251, 1254.
[1928] Eichhorn & Towers *Principles of Management:* 99; Vigoda (2002) *Public Administration Review* 528.
[1929] Bernstein (2004) *J. Int'l L & Int'l Rel.* 161; UN DESA *World Public Sector Report 2015: Responsive and Accountable Public Governance* (2015) viii.
[1930] UN DESA *World Public Sector Report 2015:* 9-10; J Speer "Participatory governance reform: A good strategy for increasing government responsiveness and improving public services?" (2012) 40 *World Development* 2379 2380.
[1931] Graham et al. *Principles for Good Governance* 3.
[1932] S 28(4) of NEMA.
[1933] S 28(4)(a).
[1934] S 28(4)(c) & (e).
[1935] S 28(4)(e).

The need to be responsive results from the fact that in urgent situations, immediate solutions are essential in the decision-making process, as explained in Chapter Four.[1936] For instance, when a unique, freshwater source such as a dam shows signs of pollution, as was the case in Carolina[1937] in 2012,[1938] it is proper for decisionmakers to restore potable water or offer an alternative source as quickly as possible.[1939] The Carolina case lasted for seven months and rendered access to clean water impossible for communities in the town, as the dam was their only source of clean water.[1940] A delay in decision making or of an attempt to allow a serious situation such as that which existed in Carolina to persist will inevitably lead to catastrophic outcomes,[1941] especially for communities depending on the polluted water source.

Similarly, the various instances of water pollution in the mining sector and abandoned or unrehabilitated mines resulting in AMD are likely to be linked to irresponsive decision making.[1942] Effects of mining on the environment in South Africa are poorly monitored thus, limiting the possibility of responsive action to prevent or mitigate water pollution.[1943]

The above indicate that some instances of water pollution concerns in the South African mining sector can be attributed to lack responsiveness in decision-making. It thus indicate that responsive administrative action is fundamental to achieve good environmental governance. Furthermore, based on the above, mandates such as water sustainability are more likely to be achieved when decision making is responsive, therefore leading to an effective outcome. The discussion of the following section focuses on efficiency in the pursuit of effective environmental decision making in the South African mining sector to highlight how efficient administrators are regarding water protection in the sector.

[1936] See section 4.2.3 of Chapter Four of this thesis.
[1937] In Mpumalanga Province.
[1938] Tempelhoff et al. (2014) *African Historical Review* 80.
[1939] Carter (2007) 173 *Geographical Journal* 335 & 337.
[1940] McCarthy & Humphries (2011) *S. Afr. J. Sci* 9.
[1941] JO Kempe (1983) *Water Science and Technology* 56; Cook et al. (2014) *Trends in Ecology & Evolution* 538.
[1942] Mhlongo & Amponsah-Dacosta (2015) 30 *International Journal of Mining, Reclamation and Environment* 279 & 284.
[1943] SAHRC "How mining damages communities and the environment" (28-08-2018) *Media* <https://www.sahrc.org.za/index.php/sahrc-media/news/item/1522-how-mining-damages-communities-and-the-environment> (accessed 31-08-2019).

6.2 Efficiency and Effectiveness of Administrative Action

Efficiency in administrative action, as explained in Chapter Five of this thesis,[1944] refers to the ability of decisionmakers to execute their mandates with available means to achieve effective outcomes.[1945] For a decision-making process to be perceived as efficient, it must be capable of achieving positive results for people concerned or likely to be affected by the consequences of the decision, including vulnerable communities.[1946] In promoting fair administrative action affecting a person[1947] or the public,[1948] PAJA seeks to promote efficient administration in South Africa.[1949] In so doing the Act promotes good governance through accountable and transparent decision making.[1950] This provision of PAJA implies that accountability and transparency can result in efficiency if enforced as required within the legal framework.[1951] Accountable and transparent decisionmakers strive to be efficient since they are willing to allow themselves to be judged.[1952]

Efficiency in decision making relating to water sustainability should imply administrators' ability to take necessary measures within reasonable means and time to ensure effective water protection against activities like mining.[1953] In that regard, water use for example, especially by the mining industry, must be licenced due to its likely effects on water resources.[1954] Licencing outlines steps to avoid adverse effects on water resources,[1955] thus, ensuring efficient and effective management of South Africa's scarce water resources.[1956]

Due to the significance of mining to the South African economy, it is possible for mining projects to be authorised by DMRE, even in circumstances that do not guarantee water

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[1944] See section 3.3 of Chapter Five of this thesis.
[1945] Cass (1986) *Va. L. Rev.* 365.
[1946] Adger, et al. 1096-1097.
[1947] S 3.
[1948] S 4 .
[1949] Preamble to PAJA.
[1950] Preamble to PAJA.
[1951] See section 3 of Chapter Six of this thesis.
[1952] Grimmelikhuijsen (2010) *Policy & Internet* 13; Gupta (2008) *Global Environmental Politics* 3.
[1953] N Mujere & M Isidro "Impacts of artisanal and small-scale minng on water quality in Mozambique and Zimbabwe" in AE McKeown & G Bugyi (eds) *Impact of Water Pollution on Human Health and Environmental Sustainability* (2015) 101 113 & 114.
[1954] Stein (2004) 83 *Tex L. Rev.* 2178.
[1955] Part 1, Chap 4 of the NWA.
[1956] B van Koppen & B Schreiner "Moving beyond integrated water resource management: developmental water management in South Africa" (2014) 30 *International Journal of Water Resources Development* 543 543 & 550.

sustainability.[1957] Prospecting and mining rights have been issued in many sensitive catchments and ecosystems in Mpumalanga.[1958] These circumstances raise concerns regarding the level of efficiency of environmental decision making in the South African mining sector. Like in the instance discussed below, how certain environmental authorisations are either granted or rejected also raise concerns regarding decision-making efficiency, thus effectiveness.

Decision making relating to AMARI's[1959] WUL application, for instance, suggests inefficiency in scrutinising applications.[1960] AMARI's application was initially refused following the public participation process during which an organisation[1961] raised concerns regarding the protection of a Critical Biodiversity Area.[1962] This scenario justifies the decisionmaker's concerns about the impacts of the proposed mining project as there is a critical water source in the area. However, the decisionmaker missed two key points, which AMARI used to its advantage in its appeal to the then Minister of Mineral Resources.

First, the then Director-General of the DMR upheld a refusal[1963] of the application because the proposed project was planned in Critical Biodiversity Area, a term framed by Cape Nature.[1964] AMARI contested the use of the term as it lacked legal definition or status.[1965] Second, it was irrational for the Western Cape Regional Manager to rely on such a term received from Cape Nature to refuse a prospecting right.[1966] It was, moreover, unlawful, as Cape Nature is not classified as a State Department.[1967]

The case above, amongst others, highlights the fact that decisionmakers may at times be inefficient in performing their duties, thus, raising competency concerns. Such lack of efficiency or competency may be due to lack of objectivity, capacity or proper

[1957] Simpson et al. (2019) *Frontiers in Environmental Science* 3.
[1958] Mhlongo et al. (2018) *Journal of Cleaner Production* 447.
[1959] Presently known as Kropz Project.
[1960] AMARI *Internal Appeal to Minster against ruling by Director-General: Refusal of Prospecting Right - Recht Investments (PTY) LTD on Portion 2 of the Farm Elandsfontein 349 District Saldanhabay, Western Cape Province Province* (2012) 3-4. Document accessible at Kropz's Cape Town office.
[1961] Cape Nature.
[1962] AMARI *Internal Appeal to Minster against ruling by Director-General:* 2-3.
[1963] By the Western Cape Regional Manager.
[1964] AMARI *Internal Appeal to Minster against ruling by Director-General:* 2-3.
[1965] 3.
[1966] S 39(4)(b)(ii) of the MPRDA - (repealed by s 33 of Act 49 of 2008).
[1967] S 39(4)(b)(ii).

understanding of the law.[1968] Decisionmakers must be efficient, thus, competent, to be able to ensure water sustainability effectively because a considerable amount of the country's water catchment areas and potentially arable land has been converted to mines, while further areas are being prospected.[1969] Water pollution is anticipated as one of the main impacts that will result from such a transformation.[1970] The situation is further exacerbated by poor governance relating to the lack of compliance, monitoring and enforcement of water sustainability by the authorities in charge of mineral resources and environmental sustainability.[1971]

The consequences of inadequate monitoring highlighted in the Mineral Sands Resources case above would have been more disastrous if it occurred in an area where there are freshwater sources downstream.[1972] In 2015, the collapse of the Fundão tailings dam[1973] in Brazil occurred partially due to lack of efficiency and thus lack of effectiveness in decision-making processes on the part of the government, accused of not effecting proper monitoring of the dam's activities.[1974] The consequences of the dam failure amongst others[1975] included the contamination of rivers downstream.[1976] The contamination killed fish and aquatic life in the process and rendered freshwater resources undrinkable for "hundreds of thousands of

[1968] HA Simon "Decision-making and administrative organization" (1944) 4 *Public Administration Review* 16 22; CER *Minimum Requirements for the Regulation of Environmental Impacts of Hydraulic Fracturing in South Africa* (2014) 16.
[1969] This is concerning, because Mpumalanga where most of these transformations are occurring holds 46% of all arable soils in South Africa. See BFAP "The Balance of Natural Resources: Understanding the longn term Impacts of Mining on Food Security in South Africa" (2015) 7.
[1970] A du Plessis *Water as an Inescapable Risk: Current Global Water Availability, Quality and Risks with a Specific Focus on South Africa* (2018) 158.
[1971] As highlighted in the Mineral Sands case discussed in section 3.2 of this chapter. See also CER "Zero Hour: New CER Report shows how mining and water authorities fail communities and environment in Mpumalanga" (23-05-2016) *News* <https://cer.org.za/news/zero-hour> (accessed 27-07-2019).
[1972] FF do Carmo, LHY Kamino, RT Junior, IC de Campos, G Silvino, ML Mauro, NUA Rodrigues, de Souza MMP & CEF Pinto "Fundão tailings dam failures: the environment tragedy of the largest technological disaster of Brazilian mining in global context" (2017) 15 *Perspectives in Ecology and Conservation* 145 149.
[1973] Dam used by a mine owned by BHP Billiton and Vale. See do Carmo et al. (2017) 15 *Perspectives in Ecology and Conservation* 145.
[1974] AM da Silva Dias, A Fonseca & AP Paglia "Biodiversity monitoring in the environmental impact assessment of mining projects: a (persistent) waste of time and money?" (2017) 15 *Perspectives in Ecology and Conservation* 206 207.
[1975] Nineteen people died and hundreds were left homeless, while the closest community (Bento Rodrigues) to the mine will not be habitable soon. See K Hudson-Edwards "Tackling mine wastes" (2016) 352 *Science* 288 288; da Silva Dias et al. (2017) *Perspectives in Ecology and Conservation* 206.
[1976] do Carmo et al. (2017) *Perspectives in Ecology and Conservation* 145.

people".[1977] This instance amongst others, including the cases in South Africa show that more efforts are needed for decision making to become well efficient and effective in the promotion of good environmental governance in the mining sector.[1978]

The different points discussed in this chapter show that poor governance practices resulting from the poor implementation and enforcement of the legal framework by government officials has led to water pollution in the mining sector. This is principally shown, amongst other, through the weaving of the various court cases analysed herein to expose government incompetence and poor governance practices.

7 Conclusion

This chapter has analysed how decisionmakers implement and enforce the legal framework to promote good environmental governance in the South African mining sector. The chapter has identified that despite the existence of multiple environmental provisions and various attempts to achieve water sustainability, the current South African legal framework still fails to mitigate water pollution as hoped by communities for instance.[1979] The failure indicates that administrative action aiming at water sustainability is not effective enough and also an indication that decision-making processes are not efficient.[1980] The consequences of failure is confirmed by the existing cases of water pollution as highlighted in Chapter Two.[1981]

The current level of water pollution caused by mining raises a question as to why the Department of Mineral Resources and Energy, for instance, does not seem to fulfil its responsibility to mitigate the impacts of mining in sensitive areas.[1982] It does not seem to be the case, because, if it were, no mining would be allowed in areas where precious freshwater catchments will be affected.[1983] Consequently, South Africa's water

[1977] MBB Guerra, BT Teaney, BJ Mount, DJ Asunskis, BT Jordan, RJ Barker, EE Santos & CEGR Schaefer "Post-catastrophe analysis of the Fundão tailings dam failure in the Doce River system, southeast Brazil: potentially toxic elements in affected soils" (2017) 228 *Water, Air, & Soil Pollution* 1 2.
[1978] MF Johnson "Strong (green) institutions in weak states: Environmental governance and human (in) security in the Global South" (2019) 122 *World Development* 433 435.
[1979] As discussed throughout this chapter.
[1980] See for example sections 2-6 of this chapter.
[1981] See section 3 of Chapter Two of this thesis.
[1982] T Davies "Mpumalanga crisis: why is nobody listening?" (15-09-2014) <http://www.groundup.org.za/media/features/mpumalanga/mpumalanga_0002.html> (accessed 07-11-2016).
[1983] Colvin et al. *Coal and water futures in South Africa:* 72; Mhlongo et al. (2018) *Journal of Cleaner Production* 447.

security is seriously threatened due to the failure to enforce compliance with environmental laws in protected and sensitive areas.[1984]

This chapter leads to the conclusion that critical aspects of good environmental governance which could have avoided the lack of effective water protection are not implemented and enforced as provided in the legal framework.[1985] These aspects, as discussed in the above sections of this chapter are cooperative governance, accountability, public participation, transparency and effectiveness. The poor outcomes due to ineffective decision making and administrative action are obviously due to poor implementation and enforcement of the legal framework.[1986] It could also be a result of various shortcomings in the legal framework as highlighted in Chapter Seven.[1987]

As a solution to avoid or limit the issues highlighted in this chapter, the next chapter proposes ways to improve administrative action for effective decision making. The next chapter also draws a conclusion of this thesis.

[1984] CER "What coal is doing to the Mpumalanga Highveld" (26-05-2015) *News* <http://cer.org.za/news/in-pictures-what-coal-is-doing-to-the-mpumalanga-highveld> (accessed 07-11-16).
[1985] As per analysis in sections 2-6 of this chapter.
[1986] As highlighted in this chapter through the discussions of the following cases: (50779/2017) [2018] ZAGPPHC 807, paras 8.10; (18701/16) [2017] ZAWCHC 25, para 161-163; DPME *Effective environmental governance in the mining sector* 2.
[1987] Chapter Seven cover such shortcomings.

CHAPTER NINE: CONCLUSION

1 Introduction

This thesis set out to determine whether the current South African environmental legal framework is effective in promoting water sustainability and good environmental governance in the mining sector.[1988] Specific focus has been on the strengths and weaknesses of the legal framework to avert or limit water pollution caused by mining.[1989] To that effect, the thesis questions whether the legal framework can be improved to ensure that clean water resources are continuously accessible to communities vulnerable to mining and affected by water pollution.[1990]

In pursuing this question, the thesis has: (i) mentioned water pollution concerns associated with mining; (ii) discussed the theoretical issues relevant to the current legal framework promoting water protection in the South African mining sector; (iii) analysed the existing legal framework; and (iv) assessed the effectiveness of the legal framework in practice. This chapter highlights the outcomes of the investigations in this thesis and ventures suggestions as to how water sustainability can be improved in the mining sector through good environmental governance.

2 Context

The research question set out in Chapter One[1991] was intended to guide the inquiry into the pursuit and achievement of environmental sustainability in the mining industry. The inquiry revealed the potential of concepts such as sustainability and governance to enable the understanding ways to prevent or mitigate water pollution in the mining sector. Another insight is the confirmation of persisting water pollution in the sector and its causes.

2.1 Environmental Sustainability and Governance in Theory

The theoretical framework analysed in this thesis covers sustainability, governance and good governance. Each of these concepts is underpinned by specific theories

[1988] See section 3 of Chapter One.
[1989] As discussed in Chapters Six, Seven & Eight.
[1990] Winkler *The Human Right to Water:* 6.
[1991] See section 3.

explained in this thesis to establish how they fit in the context of water protection in the mining sector.

2.1.1 Sustainability

This thesis argues that mining activities should be conducted in ways that minimise water pollution, if water sustainability is to be sustained in the mining sector. The concept of sustainability as explained in Chapter Three above clarifies the understanding that it is about the preservation of the environment and natural resources, such as water, for the use of present and future generations.[1992] This renders sustainability a key concept in the pursuit of safe water resources in the South African mining sector, despite that some critics perceived the concept as not encouraging development.[1993] Thus, this thesis concludes that for water to be preserved, sustainable practices, as highlighted in Chapter Three,[1994] are the appropriate measures to prevent water pollution. Such measures can ensure the use of water as a natural resource without adversely affecting the needs of fellow members of society and those of future generations.[1995]

Based on the discussions in Chapter Three, it is posited that successful realisation of environmental sustainability requires observing a series of important principles. These principles include ensuring that the environment is well preserved to afford equal intra- and inter-generational access to water.[1996] The principle of precaution suggests that water resources can be preserved and improved in terms of quantity and quality.[1997] Further, the principle of integration aims to ensure that different opinions and contributions are considered during efforts relating to the protection of water resources.[1998] The experience of communities with water pollution is evidence of the need to involve them in decision-making processes as affected and concerned persons.[1999]

[1992] See section 3.1 of Chapter Three. See also Solow (1974) *The Review of Economic Studies* 32.
[1993] See section 2.2 of Chapter Three of this thesis. See also JCJM Van den Bergh "Environment versus growth—A criticism of "degrowth" and a plea for "a-growth"" (2011) 70 *Ecological economics* 881 884.
[1994] See section 3 of Chapter Three.
[1995] DE Fisher "A jurisprudential model for sustainable water resources governance" in M Kidd, L Feris, T Murombo & A Iza (eds) *Water and the Law: Towards Sustainability* (2014) 139 141.
[1996] Fisher "A jurisprudential model for sustainable water resources governance" in *Water and the Law: Towards Sustainability* 141.
[1997] S Beder *Environmental Principles and Policies: An Interdisciplinary Introduction* (2013) 151.
[1998] See section 3.5 of Chapter Three.
[1999] Beder *Environmental Principles and Policies:* 118.

As established in the Chapter Three,[2000] it is necessary for the South African legal framework to contain provisions which promote access to clean water resources continuously amidst mining. Similarly, environmental sustainability realised through the implementation of the legal framework is likely to ensure human and environmental safety,[2001] given that members of society depend on the natural environment for survival.

In terms of regulation for the realisation of water sustainability in the mining sector, it is established in Chapter Six above that the South African legal framework makes provision for that purpose.[2002] In that regard, the Constitution sets mandates, including state duties to achieve water sustainability in the mining sector.[2003] It is further established that the mandate is pursued through law and policy -making, legal interpretation and administrative action for legal implementation and enforcement.[2004]

There are various provisions in the legal framework[2005] that apply to environmental concerns in the mining sector and which can promote water sustainability. Promotion of water sustainability is more likely if the provisions promote fairness, morality, and justice through effective implementation and enforcement of the legal system.[2006] It is important to have provisions, as highlighted in Chapter Six, that can promote water sustainability in the mining sector. However, such provisions can only reach their objectives if they are properly implemented. But further, implementation alone would not be sufficient to promote water sustainability. Therefore, there must be legal guidelines to monitor and enforce compliance, to ensure that the legal framework can effectively promote water sustainability.[2007]

It is argued in this thesis that water sustainability can be promoted through environmental decision making, to improve the members of society's dependence on the natural environment for survival.[2008] It is posited that the implementation of the

[2000] See section 4.1 & 4.2 of Chapter Three.
[2001] See section 4.3 of Chapter Three.
[2002] See section 3 of Chapter Six.
[2003] See section 2 of Chapter Six.
[2004] S 24(b) of the Constitution; Feris Feris (2010) *PELJ* 77.
[2005] See section 3 of Chapter Six.
[2006] Verdonck (2015) *Hum. Rts. & Int'l Legal Discourse* 38-39; S 33(1) of the Constitution.
[2007] See section 3.1.2 of Chapter Six.
[2008] See section 4.4 of Chapter Three. See also T Prugh, H Daly, R Goodland, JH Cumberland & RB Norgaard *Natural Capital and Human Economic Survival* 2nd ed (1999) 44.

legal framework can be more effective if good environmental governance is employed in administrative action for that purpose.

2.1.2 Realisation of Water Sustainability through Good Governance

Chapter Four explains the concept of governance to highlight its relevance to environmental sustainability in the mining sector. Governance is presented as a concept that is meant to achieve the optimum performance of individuals or organisations through decision-making processes as explained in Chapter Four.[2009] Following the study of the concept, this thesis asserts that governance of the environment is critical to achieve environmental sustainability in the mining sector.[2010]

This thesis relies on the three main characteristics of environmental governance that can promote the protection of water resources in the mining sector. First, the proper protection of water resources requires effective decision making as the core feature of governance.[2011] Decision making is a process by which decisions or actions are taken regarding the realisation of specific targets such as water protection.[2012] In the context of admininstrative decision-making,[2013] such decisions are known as administrative actions and are achievable where the principle of rationality is applied to reach objective outcomes. Where rational decision making is not possible, bounded and communicative rationalities, as discussed in Chapter Four,[2014] become alternatives, though they have shortcomings too.

Second, the pursuit and achievement of water sustainability, as a target, requires proper planning.[2015] Decisionmakers must plan strategically to yield positive results such as reaching set targets.[2016] The realisation of targets requires the planner to be

[2009] See section 4.1 of Chapter Four. See also F Fukuyama "What is governance?" (2013) 26 *Governancee: An International Journal of Policy, Administration, and Institutions* 347 348-349.
[2010] See section 3 of Chapter Four of this thesis.
[2011] Poff et al. (2003) 1 *Ecological Society of America* 299-300.
[2012] See section 4 of Chapter Four.
[2013] See section 4.1 of Chapter Four.
[2014] See sections 4.1.2 and 4.1.3 of the Chapter.
[2015] Pollard & Du Toit (2008) *Water SA* 673.
[2016] Pollard & Du Toit (2008) *Water SA* 674 & 677.

able to prioritise and be flexible.[2017] A planner is also expected to be efficient, thus, able to identify when critical decision-making is required.[2018]

Third, decision-making processes relating to water protection must involve the enforcement of laws relating to water protection. Legal enforcement requires decisionmakers to be able to identify where and when law enforcement is necessary. Decision making through administrative action can put an end to or limit further pollution of water resources and promote the rehabilitation of polluted water sources if taken seriously.[2019]

Though governance is necessary for the pursuit of water sustainability, this thesis reaches a conclusion that the quality of governance is likely to render environmental governance more effective.[2020] While governance seeks the performance of individuals or organisations through decision making,[2021] *good* governance seeks performance through decision making in its best possible form.[2022]

Following the discussions of good governance in Chapter Five, it is established that the quality of governance is critical in attempts to achieve positive outcomes such as sustainable water resources in the mining sector.[2023] Thus, it arises from those discussions that good environmental governance in theory, can guide effective decision-making.[2024] Similarly, the theory can serve as a tool at the disposal of the governed or concerned and affected members of society to evaluate the performance of decisionmakers.[2025]

[2017] Fourie & Brent (2006) *Journal of Cleaner Production* 1087 & 1089.
[2018] F Iraldo, F Testa & M Frey "Is an environmental management system able to influence environmental and competitive performance? The case of the eco-management and audit scheme (EMAS) in the European Union" (2009) 17 *Journal of Cleaner Production* 1444 1445-1446.
[2019] W Du Plessis & AA Du Plessis "Striking the sustainability balance in South Africa" in MG Faure & W Du Plessis (eds) *The Balancing of Interests in Environmental Law in Africa* (2011) 454.
[2020] Adger et al. (2003) *Environment and Planning* 1098.
[2021] See section 4.1 of Chapter Four.
[2022] Grindle (2004) *Governance* 525.
[2023] Hogl et al. "Legitimacy and effectiveness of environmental governance - concepts and perspectives" in *Environmental Governance: The Challenge of Legitimacy and Effectiveness* 2.
[2024] See section 3 of Chapter Five.
[2025] See 3.3 of Chapter Five. See also M Lockwood "Good governance for terrestrial protected areas: A framework, principles and performance outcomes" (2010) 91 *Journal of environmental management* 754 755.

Decision-making must include the essential elements of good governance,[2026] to be perceived as involving good governance practices.[2027] The critical role that those elements play is their ability to promote co-operative governance among decisionmakers for effective administrative action.[2028] The elements also provide guidance on how decisionmakers can be accountable by enabling transparency and public participation.[2029] Similarly, those elements indicate ways in which decision making can become effective and efficient in achieving intended outcomes,[2030] such as water sustainability.

It is argued that decision-making processes involving transparency in the pursuit of water sustainability can promote public participation.[2031] With co-operation, transparency, and participation guaranteed, this thesis argues that proper and accountable decision making is more likely to take place. Proper accountability suggests that decision-making processes are responsive, effective and efficient.[2032] Accountability will follow because responsible decisionmakers are likely to be responsive when they are driven by effective and efficient decision-making habits.[2033]

As in the case of sustainability, the legal framework makes provisions to promote good environmental governance.[2034] The provisions have the potential to promote water sustainability through good governance practices[2035] if effectively implemented and enforced. This thesis thus argues that good governance practices can achieve water sustainability if decisionmakers allow themselves to be guided by current laws and judicial decisions targeting environmental protection.[2036] Successful decision making and effective administrative actions are rendered possible by proper implementation

[2026] Discussed in section 3 of the chapter.
[2027] EC *European Governance - A White Paper* (2001) 27; Hogl et al. "Legitimacy and effectiveness of environmental governance - concepts and perspectives" in *Environmental Governance: The Challenge of Legitimacy and Effectiveness* 6.
[2028] See section 3.1 of Chapter Five.
[2029] See section 3.2 of Chapter Five.
[2030] See section 3.3 of Chapter Five. See also European Commission “European governance - a white paper” (2001) 27.
[2031] Harrison & Sayogo (2014) *Government Information Quarterly* 513; W Funk "Public participation and transparency in administrative law-Three examples as an object lesson" (2009) 61 *Admin. L. Rev.* 171 180 & 185.
[2032] A Føllesdal "The legitimacy challenges for new modes of governance: trustworthy responsiveness" (2011) 46 *Government Opposition* 81 82 & 89.
[2033] GA Schubert "“The public interest” in administrative decision-making: Theorem, theosophy, or theory?" (1957) 51 *APSR* 346 348-349, 356 & 362.
[2034] See section 2 of Chapter Six.
[2035] As highlighted in Chapter Five of this thesis.
[2036] Blunt (1995) *Public Administration and Development* 6.

and enforcement of principles of good governance as promoted through the legal framework.

After establishing the potential of sustainability and good governance in theory and the ability of the legal framework to promote water protection through administrative action, this thesis then investigated their effectiveness in practice. The concerning outcome of the said investigation is exposed below.

2.2 Mining: A Persisting Threat to Water Resources in South Africa

Following discussions in Chapter One of this thesis,[2037] it is confirmed from existing literature that, for more than a century, mining has been an important pillar of the South African economy.[2038] Without mining's significant contribution to South Africa's economy, the GDP will certainly drop, and the unemployment rate will increase.[2039]

Despite the economic importance of mining, this thesis establishes that there are environmental challenges such as water pollution that South Africa is facing in its mining sector (from operational and abandoned mines).[2040] Hence, this thesis posits that water pollution in the mining sector is problematic, because South Africa is a water-scarce country.[2041] Water pollution is also problematic because communities' livelihoods are under threat due to a lack of, or limited access to clean water for drinking and agriculture, amongst others.[2042] These issues arise despite provisions regarding processes like environmental impacts assessments and environmental management programmes to prevent or limit water pollution, as discussed in Chapter Six.[2043]

Existing facts show that issues relating to water pollution have become very common in South Africa over the years, with mining being one of the leading causes of the said pollution.[2044] Following the discussions in Chapter Two, it is concluded that mining

[2037] See section 2 of Chapter One.
[2038] L Marais, FH McKenzie, E Nel, D van Rooyen & P Burger "The way forward for Postmasburg" in P Burger, L Marais & D van Rooyen (eds) *Mining and Community in South Africa: From Small Town to Iron Town* (2017) 229 229; B Fine *The political economy of South Africa: From minerals-energy complex to industrialisation* (2018) 8.
[2039] As highlighted in section 1 of Chapter One of this thesis.
[2040] This is shown in section 3 of Chapter Two as well as throughout Chapter Eight.
[2041] OO Ololade "Understanding the nexus between energy and water: A basis for human survival in South Africa" (2018) 35 *Development Southern Africa* 194 194-195.
[2042] Ololade (2018) *Development Southern Africa* 196.
[2043] See sections 3.1.1.2 and 3.1.1.3 of Chapter Six.
[2044] See section 2.1 of Chapter One.

continues to have adverse impacts on water resources due to various practices in the mining sector. This thesis also shows that the methods of mining are by nature an issue as they cause both underground and surface water pollution.[2045]

One major consequence of mine-related water pollution arising from already established facts is its effects on human life as highlighted in scientific research.[2046] Community members' health is negatively affected when they consume water polluted with heavy metals.[2047] Farming, as an important component of food security, is under constant threat in parts of the country where mining practices occur.[2048] Soil becomes less productive due to contamination caused by mine-contaminated water such as AMD infiltrating from topsoil or rising from underground mines.[2049] Similarly, polluted water adversely affects biodiversity, thus, destroying the ecosystem and vegetation, which serve as livestock feed.[2050] This impact on biodiversity further affects food security negatively.[2051]

The review in Chapter Two shows that water pollution resulting from mining persists.[2052] Such persistence indicates that the achievement of water sustainability in practice is challenging and the issue lies with a lack of effectiveness of the legal framework, demonstrated below as the key insights of this thesis. This thesis seeks to resolve the issue through measures recommended further down.[2053]

3 Key Insights

Based on the theoretical concepts of sustainability, governance and good governance, this thesis argues that environmental water sustainability in the mining sector is achievable. Facts presented in Chapter Two above indicate existing instances of water pollution as a proof that water sustainability promoted through good environmental governance is far-fetched.[2054] From that perspective and taking into account other outcomes in this thesis, it is safe to suggest that the legal framework identified in this

[2045] See section 2.2 of Chapter Two of this thesis.
[2046] See section 4 of Chapter Two.
[2047] Ochieng et (2010) *Scientific Research and Essays* 3352.
[2048] S Naidoo "An assessment of the impacts of acid mine drainage on socio-economic development in the Witwatersrand: South Africa" (2015) 17 *Environment, Development Sustainability* 1045 1059.
[2049] 1059.
[2050] Mhlongo et al (2018) *Journal of Cleaner Production* 446.
[2051] U Human "Competition for land use-a threat to agriculture?" (2017) 3 *FarmBiz* 30.
[2052] See precisely sections 3 and 4 of Chapter Two.
[2053] See section 4 of this chapter.
[2054] See section 3 of the chapter.

thesis as a means to promote water sustainability,[2055] is not as effective as it ought to be. Although legal provisions exist and there are various attempts to achieve water sustainability, this thesis establishes that the current legal framework still fails to control water pollution effectively.

Various aspects of the legal framework discussed in Chapter Six, including the environmental constitutional mandate of decisionmakers promoted through legislation and case law seek to promote water sustainability.[2056] This suggests that water sustainability should be better than it is currently.

In the final analysis, two principal insights stand out as reasons for the lack of effectiveness of the legal framework: Shortcomings within the legal framework and poor decision-making processes.

3.1 Shortcomings in the Legal Framework

Though this thesis establishes that the legal framework provides extensively for water protection amidst activities such as mining,[2057] some provisions lack the potential to realise water sustainability.[2058] Such provisions are well-intended, but based on how they are framed, it proves difficult for them to be implemented effectively and thus successfully serve the purposes for which they were enacted.[2059] These include provisions relating to the OES and financial provision for mine rehabilitation, as well as provisions relating to section 24G of NEMA and EIAs.[2060]

With regard to EIA processes, it is established from the analysis of the legal framework that aspects of environmental authorisation such as the EIAs are compiled entirely by companies' appointed environmental assessment practitioner (EAP).[2061] The concern is that some assessment reports are often misleading and public participation processes are also often very poor and at times, simply box-ticking exercises.[2062]

[2055] See section 3.2 of Chapter Six.
[2056] B Morkel & M De Wit "South Africa - Trying not to repeat history: Are shale gas development and broad-base economic development compatible" in S Gamper-Rabindran (ed) *The Shale Dilemma: A Global Perspective on Fracking and Shale Development* (2018) 357.
[2057] As discussed in Chapter Six.
[2058] Highlighted in section 2 of Chapter Seven. See also Bentley & Calland "Access to information and socio-economic rights: A theory of change in practice" in *Socio-Economic Rights in South Africa: Symbols or Substance?* 341 361.
[2059] Kohn (2012) *SAJELP* (pages unnumbered).
[2060] Discussed in section 3 of Chapter Seven.
[2061] See section 2.1.1 of Chapter Seven.
[2062] As highlighted in section 2 of Chapter Seven.

Because the DMRE has no control over EIAs processes, this thesis concludes that the DMRE's decision-making processes regarding environmental authorisations are likely to fail in the pursuit of water sustainability when EIAs are not up to standard.[2063]

The OES, for instance, which is in line with the concept of co-operative government as provided by the Constitution,[2064] gives the task of implementing NEMA in the mining sector to the department responsible for mineral resources.[2065] The issue as remarked by various authors and highlighted in Chapter Seven above[2066] is that the implementation of the environmental management provisions by the DMRE leads to a conflict of interest, as its mandate is to ensure economic development in the mining sector.[2067] However, even with the entering into force of the OES, which was supposed to strengthen environmental protection, environmental sustainability in mining-affected areas remains concerning for South Africa.[2068] Water pollution resulting from the adverse impacts of mining on the environment continues to be visible.[2069] Mining's continuously negative impacts on South Africa's dwindling water resources means that issues such as environmental pollution persists[2070] and are also attributed to limited or lack of co-operative governance.[2071]

This thesis also identifies that section 24G fails to show potential to prevent water pollution as it only seeks to correct a breach of the law that has already occurred.[2072] Thus, this thesis argues that section 24G is a legislative anomaly which enables mining companies to commit unlawful acts before attempting to legalise them.

Another outcome is the provisions relating to financial provision for mine rehabilitation. They do not offer sufficient clarity as to where the funds are kept and how they must

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[2063] Leonard (2017) *JEAPM* 10; Kengni "Intergovernmental relations: One Environmental System" in *Co-ordinating Governance for Mining: Streamlining Systems for Improved Intergovernmental Relations* 47.
[2064] Chap 3 of the Constitution.
[2065] 24 C(2A) of NEMA.
[2066] See section 3.2 of the chapter.
[2067] L Louw *Addressing critical water and waste issues in Environmental Impact Assessment (EIA): the case of coal mining in South Africa* North-West University (2018) 8.
[2068] F Kapfudzaruwa, S Kudo, O Mfune, M Hansen & J Nyerere *Rural-Urban Linkages and Sustainable Development in Africa* (2018) 161.
[2069] As highlighted under section 1 of Chapter Eight of this thesis.
[2070] Ololade (2018) *Development Southern Africa* 201.
[2071] See also the discussion in section 2 of Chapter Eight. See also DPME *Effective Environmental Governance in the Mining Sector* 2-3.
[2072] See section 3.1 of Chapter Seven.

be used.[2073] Although it is provided that funds must be held in a Trust for purposes of mine rehabilitation,[2074] there is no strict measure to ensure that once such funds are set aside, they can only be withdrawn and used for the purpose for which they are intended.[2075] The legal framework also fails to promote transparency regarding the management of the funds as there is no clear indication of where and how such funds must be held and utilised once transferred from the Trust.[2076]

Based on the above, this thesis concludes that limited effectiveness and efficiency of the legal framework are in part due to the shortcomings within the legal framework; thus, obstacles to water sustainability.[2077] However, despite the shortcomings, this thesis argues that the framework in its current form can promote water sustainability in the mining sector. Thus, another main issue impeding the effectiveness of the legal framework from promoting water sustainability through good governance effectively is poor legal implementation as shown below.

3.2 Poor Environmental Decision-Making Processes

This thesis argues that the failure to control water pollution effectively is attributable to poor governance practices by decisionmakers tasked with the mandate to ensure water protection in the South African mining sector. The failure indicates limited efficient decision-making processes resulting in less effective administrative action in the pursuit of water sustainability in the mining sector.[2078]

The current level of water pollution caused by mining raises questions as to why the DPMRE does not fulfil its responsibility to mitigate the impacts of mining on water resources.[2079] In that regard, based on the main highlights of Chapter Eight, this thesis argues that decisions and actions of state organs such as the DMRE and the DEFF have failed to promote water protection. The decision to authorise mining in the Mabola area, for instance,[2080] is a threat to water resources which fails to protect a

[2073] OECD *OECD Environmental Performance Reviews:* 51.
[2074] Clause 3 of Appendix 2 of the Financial Provisioning Regulations of 2015.
[2075] As explained in section 4 of Chapter Seven of this thesis.
[2076] Section 4 of Chapter Seven.
[2077] J Barendse, D Roux, B Currie, N Wilson & C Fabricius "A broader view of stewardship to achieve conservation and sustainability goals in South Africa" (2016) 112 *South African Journal of Science* 1 7.
[2078] Føllesdal (2011) 46 *Government Opposition* 89 & 99.
[2079] Davies “Mpumalanga crisis: why is nobody listening?”
[2080] See section 2 of Chapter Eight.

sensitive water source as required in terms of the NWA.[2081] If decisions were being carried out properly, no mining would be allowed in areas where freshwater catchments will be affected. The failure to enforce compliance with environmental laws in protected and sensitive areas, among others, suggests that South Africa's water security is under constant threat from mining.[2082]

From the above, this chapter stresses that critical aspects of good environmental governance are not implemented and enforced as provided in the legal framework, thus, leading to less effective water protection.[2083] The aspects include co-operative governance, accountability, public participation, transparency, and effective and efficient decision making.

Looking at the highlights of Chapter Six of this thesis,[2084] it would be expected that the legal framework is able to achieve water sustainability following proper implementation. In reality, although officials tasked with the duty to implement the laws do make efforts, they also fail dismally in important respects, as shown in Chapter Eight.[2085] Their failures are attributed to unreasonable and unfair administrative actions resulting from poor environmental decision-making processes. This thesis concludes that such unreasonable and unfair administrative actions are characterised by gross lack of accountability and decisionmakers' incompetence.[2086] Some decisions clearly lack the standards set by PAJA.[2087] Transparency and access to information, as well as public participation requirements, are often flouted. This prevents stakeholders such as affected and interested parties – those who should play checks-and-balances roles to help ensure that decisionmakers remain accountable[2088] - from fulfiling their functions properly.

It also emerges from the discussions in Chapter Eight,[2089] that poor administrative actions are due to lack of collaboration for water protection between the DMRE and

[2081] Ss 3 & 37(4) of the NWA; (50779/2017) [2018] ZAGPPHC 807, para 8.10.
[2082] CER "What coal is doing to the Mpumalanga Highveld" (2015).
[2083] E Herrfahrdt-Pähle "South African water governance between administrative and hydrological boundaries" (2010) 2 *Climate and Development* 111 113.
[2084] See for example section 3 of Chapter Six.
[2085] See section 3 of the chapter.
[2086] As explained in section 3.2 of Chapter Eight.
[2087] S 6(2) of PAJA.
[2088] See sections 3.2.1 & 3.2.2 of Chapter Five of this thesis. See also Grimmelikhuijsen (2010) *Policy & Internet* 13; Wang & Wan Wart (2007) *Public Administration Review* 269.
[2089] As established in section 2 of Chapter Eight.

DEFF, which does not conform to the requirements and intention of the OES.[2090] This defeats the purpose of co-operative government as provided by the Constitution,[2091] to promote joint efforts which are crucial to achieving environmental sustainability in the mining sector.[2092] The *Mineral Sands* case, among others, is an excellent example of such instances.[2093]

Further outcomes clearly indicate that the DMRE should not be the competent authority to ensure the implementation of environmental laws in the mining sector, because it lacks the required capacity to ensure proper implementation.[2094] The DMRE's position as the competent authority to issue environmental authorisations for mining also results in a conflict of interest, as the DMRE's principal mandate - which is economic development through optimal extraction - directly contradicts environmental protection.[2095]

Based on the above findings, this thesis concludes that decision making regarding the implementation and enforcement of the legal framework must improve to effectively promote water sustainability in the South African mining sector. To contribute towards such efforts and improvement, the thesis makes the following recommendations.

4 Recommendations

The findings of this thesis show that the legal framework is not effective, either because of poor implementation and enforcement or due to flaws in the framework itself, leading to issues such as conflicts of interest.[2096] These issues have consequently become an obstacle to the realisation of water sustainability. South Africa needs to preserve its already scarce water resources, through minimising the impact of mining operations on the water resources, among others. Improvements to the content and implementation of laws can promote environmental sustainability. It is also very likely that good environmental governance promoted through the legal

[2090] As highlighted in section 3.1.2 of Chapter Six.
[2091] Chap 3 of the Constitution.
[2092] DPME *Effective Environmental Governance in the Mining Sector* 2.
[2093] (18701/16) [2017] ZAWCHC 25, para 75.
[2094] As highlighted in section 3.2 of Chapter Seven. Republic of South Africa *Report on the Implementation Evaluation of the Effectiveness of Environmental Governance in the Mining Sector* v; SAHRC *National Hearing on the Underlying Socio-economic Challenges of Mining-affected Communities* 5.
[2095] Discussed in section 2 of Chapter Eight.
[2096] Such issues are highlighted in Chapters Seven and Eight.

framework can serve as a powerful tool to realise water sustainability in the South African mining sector. However, law reform is necessary to ensure the promotion of good environmental governance aiming at water protection in the South African mining sector. The following discussions point out ways in which such issues should be addressed.

4.1 Proactive Legislative Measures

This thesis argues that one way to ensure water sustainability is to be proactive in environmental decision-making processes.[2097] Being proactive helps to limit or even avoid water pollution altogether.[2098] Hereunder are some issues that can be addressed through law reform to render the legal framework more proactive.

4.1.1 Scoping Report and Environmental Management Programme

The issue of EIAs and requirements such as scoping report and EMPr require a rethink. It is important to provide for EIAs to prevent water pollution proactively. In this regard, the issue with the current South African legal framework that must be addressed, as underlined in Chapter Seven of this thesis is the provision for specific guidelines on how EIAs must be conducted.[2099] For instance, considerations of how to remediate water pollution should not be at the sole discretion of an Environmental Assessment Practitioner. This thesis acknowledges that EAPs are professionals who should perform their duties as per the ethics of their profession.[2100] This notwithstanding, this thesis argues that it is inappropriate for the state to leave the fate of South Africa's scarce water resources in the hands of independent EAPs. They are not contracted by the state but by mining companies that are more likely to focus more attention on economic goals.[2101]

A recommendation regarding legal reform to improve EIAs is that the state be involved in the EIA processes. Two scenarios are envisaged in this regard: Either state-appointed practitioners conduct the EIAs alone, or they collaborate (preferably in a

[2097] AR Mareddy, A Shah & N Davergave *Environmental Impact Assessment* 217.
[2098] See section 3.1 of Chapter Six of this thesis.
[2099] Highlighted in section 2 of Chapter Seven.
[2100] See section 2.1.1 of Chapter Seven. See also Kidd & Retief "Environmental assessment" in *Environmental Management in South Africa* 995.
[2101] There are instances where EAP lack independence in the performance of their duties and their EIAs are often subjectively worded and mostly favouring the applicant. See S Brownlie *Review of Environmental Impact Assessment Report & Environmental Management Programme, and Environmental Authorisation, for Yzermyn underground coal project* (2016) 8.

supervisory role) with EAPs appointed by the applicant for an environmental authorisation. In both scenarios, the cost must be borne by the applicant. EIAs conducted with the involvement of state officials, or contractors can improve accountability in administrative action because decisionmakers will rely on data that is more likely to be objective if conducted in the interest of society.

4.1.2 Public Participation

With regard to EIAs, law reform is required to improve public participation as it can ensure water sustainability proactively as highlighted in this thesis.[2102] Thus, consultation processes should not be simple box-ticking exercises; rather, they should be a process through which the opinions of affected and concerned parties are gathered for effective decision making.[2103] Box-ticking exercises cannot help in collecting and addressing contradicting opinions regarding the authorisation of mining projects in areas where water sources are threatened.[2104] Though limited timeframes[2105] are advanced as being "woefully insufficient for scientifically sound impact assessment",[2106] they should not justify the failure to consult with people who will be affected by an outcome of a decision or action. Effective consultation will ensure that decisions are taken based on unflawed consultation processes.[2107] Such unflawed processes will afford the public or affected communities the opportunity to either object to environmental decision making that does not favour water sustainability. Similarly, proper consultation allows the communities to contribute meaningfully to decision and actions aimed at achieving water sustainability during EIAs.

Legal reform must be considered for the achievement of more effective public participation processes. Effective public participation ensures transparency in the interest of communities vulnerable to the environmental impacts of mining. To that

[2102] See section 5 of Chapter Eight of this thesis.
[2103] (CCT 39/10) [2010] ZACC 26, para 9.
[2104] D Huizenga "Governing territory in conditions of legal pluralism: Living law and free, prior, and informed consent (FPIC) in Xolobeni, South Africa" (2019) *The Extractive Industries and Society* 711 717.
[2105] As discussed in section 2.1.3 of Chapter Seven of this thesis.
[2106] M Fourie *Written Comments on the Draft Environmental Impact Assessment Regulations* (2014) 1.
[2107] Various instances including court cases discussed in this thesis are an indication of how public participation in the South African mining sector is flawed. See for example section 2.1.2 of Chapter Seven of this thesis.

effect, the government[2108] needs to have more control over consultation processes. The government can either oversee consultation processes or conduct it entirely through appointed EAPs. Should the legal framework empower the government to conduct public participation in the mining sector, it will allow the government to reassure the communities which feel abandoned by the same government that supposed to protect them.[2109] It can also change the notion that the government is condoning environmental crimes committed by mining companies.[2110] Similarly, the competent authority to grant EAs will not appear ignorant of the fact that a proper public participation process never occurred during certain EIAs.[2111] Finally, by taking over public participation or effectively overseeing it, the government could feature less in court cases relating to those processes, provided, administrative action pertaining to public participation and transparency is well accountable.

Proactive actions to prevent water pollution are not a guarantee that water pollution will never occur in the mining sector. However, a legal framework that can promote effective proactive decision making is likely to limit water pollution better than it is the case today. The discussion that follows highlights how other flaws like uncertainty can be remedied through law reform.

4.2 Remedying Uncertainty: The One Environmental System

Legislative uncertainty is one thing that cannot promote water sustainability.[2112] The OES, as discussed in this thesis is one area where the legal framework does not seem to create certainty regarding effective cooperative governance.[2113] The OES should allow more input by other departments involved in the OES without allowing the DMRE as the competent authority being dominant.[2114] Unlike the DMRE, the DEFF and the DWS have more capacity and expertise regarding dealing with environmental and

[2108] Specifically, the DMR, the DEA and the DWS.
[2109] E Cairncross & S Kisting "Platinum and gold mining in South Africa: The context of the Marikana massacre" (2016) 25 *New Solutions: A Journal of Environmental and Occupational Health Policy* 513 520 & 530-531.
[2110] Leonard & Lebogang (2018) *Sustainable Development* 214.
[2111] As was the case in CC (14/1740/2010) [2011].
[2112] C Wood *Environmental impact assessment in developing countries: an overview* (2003) Conference on New Directions in Impact Assessment for Development: Methods and Practice 8 & 20-21.
[2113] See section 3.2 of Chapter Seven of this thesis.
[2114] P Mapulane *One Environmental System colloquium* (20-11-2018) <https://pmg.org.za/committee-meeting/27570/> (accessed 05-08-2019).

water issues respectively.[2115] It should be the mandate of the DEFF and the DWS to enforce environmental - water sustainability as they are designed to fulfil those mandates.[2116]

This thesis argues that legal reform is necessary to improve co-operative governance in administrative action aiming at water sustainability in the South African mining sector. A proposition is made in twofold: The DEFF should be designated as the competent authority to implement and enforce environmental provisions in the mining sector as in other sectors with room for the DMRE to make inputs. Alternatively, the DMRE can remain the competent authority regarding environmental protection in the mining sector, but with equal input in decision-making processes granted to DEFF and DWS. This means that the latter departments should have veto powers allowing them to oppose actions taken by the DMRE if such actions do not align with sustainability goals.

This thesis anticipates that law reform seeking to ameliorate co-operative governance in favour of environmental protection and water sustainability, in particular, will resolve several issues. Reform aimed at improving cooperative governance will relieve the DMR of the pressure of pursuing conflicting interest by trying to balance economic development and environmental protection and being seen as often favouring economic development.[2117] Law reform will also shift the responsibility from the DMRE, which lacks sufficient capacity[2118] to deal effectively with various environmental concerns arising from the mining sector. The DMRE is believed to be understaffed in the area of environmental monitoring.[2119] There are instances which suggest that some of the few environmental practitioners employed by the DMRE lack the required expertise and experience to deal with environmental issues, including

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[2115] DPME *Effective Environmental Governance in the Mining Sector* 3; (18701/16) [2017] ZAWCHC 25, paras 77 & 181; K Pietersen, T Kanyerere, A Levine, A Matshini & HE Beekman "An analysis of the challenges for groundwater governance during shale gas development in South Africa" (2016) 42 *Water SA* 426.
[2116] (18701/16) [2017] ZAWCHC 25, para 75.
[2117] Leonard (2018) *Social Sciences* 7.
[2118] DPME *Effective Environmental Governance in the Mining Sector* 3; Kengni "Intergovernmental relations: One Environmental System" in *Co-ordinating Governance for Mining: Streamlining Systems for Improved Intergovernmental Relations* 48; Leonard (2018) *Social Sciences* 9.
[2119] PMG "MineralBRRR" (2018) <https://pmg.org.za/page/MineralBRRR> (accessed 06-08019); PMG *Report of the Portfolio Committee on Mineral Resources on its activities undertaken during the 5th Parliament (May 2014 – March 2019)* (2019) 5.

water pollution in the mining sector.[2120] Law reform is not the silver bullet that will take care of water pollution once and for all, but it may improve water protection in the South African mining sector. The next section discusses a reform to improve mine closure.

4.3 Improving Mine Closure Processes

It is possible to resolve the issue of unrehabilitated mines across South Africa or at least reduce their numbers considerably, provided there is availability of enough funds earmarked for that purpose.[2121]

Law reform is necessary to improve the availability of funds for mine rehabilitation. Since many mining companies end up bankrupt, it is suggested that the legal framework provides for rehabilitation funds to be ring-fenced. This will ensure that funds meant for rehabilitation will be available when needed, especially where the concerned mining company is unable to raise alternative funds. To improve accountability, this thesis proposes that information regarding such funds must be accessible to all stakeholders, to ensure transparency.

Alternatively, law reform should provide for progressive rehabilitation that is monitored on a regular basis. In this regard, the department responsible for implementing and enforcing environmental sustainability in the mining sector would have to employ or train qualified environmental practitioners for monitoring purposes. Such practitioners will have to visit mine sites at specific intervals, not only to monitor compliance with provisions concerning the mitigation of issues like water pollution but will have to monitor progress made regarding rehabilitation.

Reforms recommended above are likely to promote effective decision making as they seek to strengthen the achievements of administrative action, including water protection which is the goal of this thesis. For instance, proactive decision making through effective EIAs has the potential to limit the adverse effects that can be caused

[2120] CER *Zero Hour: Poor governance of mining and the violation of environmental rights in Mpumalanga* 53; (18701/16) [2017] ZAWCHC 25, para 181.
[2121] See section 4 of Chapter Seven of this thesis. See also ES Van Eeden, M Liefferink & JF Durand "Legal issues concerning mine closure and social responsibility on the West Rand" (2009) 5 *TD: The Journal for Transdisciplinary Research in Southern Africa* 62.

by the flaws in section 24G of NEMA.[2122] If the government or its contractor is involved in EIAs processes, it is likely to know when unauthorised mining activities are going on as they would be conducting EIAs on the same site.

Though this thesis finds the above reforms necessary to improve water protection in the mining sector, there is no guarantee that they would be effected as they may be hindered by various challenges as discussed below.

4.4. Challenges Likely to Hinder Law Reform

Considering law reform or identifying a need for one is easy but carrying it out is a totally different thing. Failure to carry out law reform can be caused by various factors. Amongst others, there is lack of political will due to which no good reform can take place.[2123] In the absence of political will decisionmakers are likely to lack the motivation to effect necessary reforms to improve water protection in the mining sector. The lack of political will is possible in the South African context where the key decisionmaker responsible for the protection of water resources in the mining sector has as main mandate the promotion economic development.[2124]

Also, law reform is likely to be hindered by lack of capacity and resources. The lacking is likely to render even political will meaningless. Lack of capacity may be synonymous to a lack of necessary personnel at the DMR, for example, capable of conceiving and proposing reforms to improve the ability of the existing legal framework to address water pollution in the mining sector.[2125] Lack of resources, on the other hand, can hinder law reform where the decisionmakers lack the skills and the support and cooperation of other government departments necessary for the conception and proposition of law reform.[2126]

Above all, this thesis argues that for the legal framework to achieve its goal, government officials involved in the pursuit of water sustainability in the mining sector must be properly acquainted with the legal mandate regarding water sustainability.

[2122] O Lwabukuna "Interrogating and reviewing legal and policy frameworks governing acid mine drainage in South Africa" in M Mujuru & SS Mutanga (eds) *Management and Mitigation of Acid Mine Drainage in South Africa: Input for Mineral Beneficiation in Africa* (2017) 127.
[2123] C Botha & B Bekink "Law reform in South Africa: 21 years since the establishment of a supreme constitutional dispensation" (2018) 6 *The Theory and Practice of Legislation* 263 285.
[2124] See section 3.2 of Chapter Seven of this thesis.
[2125] Botha & Bekink (2018) *The Theory and Practice of Legislation* 279.
[2126] 279.

Similarly, any such official must strive to rely on good governance practices to execute rational environmental tasks for the benefit of present and future generation.

Inquiries in this thesis show that there are other angles from which issues discussed herein can be analysed. However, as highlighted below the issues are beyond the scope of this thesis and can be the subject of separate projects.

5 Future Research

Based on the findings in the thesis, it is obvious that there are key aspects that require further investigation:

1. The One Environmental System (OES) is narrowly discussed in this thesis to serve a specific purpose, which is the clarification of government departments' mandates and priorities in the context of cooperative governance. This thesis acknowledges that there is a need for further study to establish whether the OES in its current format can achieve effective water protection in the mining sector. Further research can rely on the flaws of the OES highlighted in this thesis as the basis of an in-depth analysis of the strengths and weaknesses of the OES. Establishing the prospect of effective water protection through the OES will require to determine among others how many environmental authorisations have be awarded or rejected by the DMRE. It also requires determining the rationality of those authorisations and of other environmental decision-making processes by the same department and their outcomes following statistical and data analysis.

2. Despite focusing mainly on the role of the government in terms of water protection in the mining section, this thesis acknowledges that water pollution in the mining sector cannot be solely attributed to the government, since mine companies are the cause of the pollution. Therefore, the responsibility of mining companies regarding compliance must be investigated beyond the scope of this thesis. Instances of water pollution analysed in this thesis can serve as background information to further investigate the involvement of mining companies in the pollution of South Africa's water resources.

6 Concluding Thought

In theory, water sustainability is achievable in the South African mining sector. Although the legal framework has its shortcomings, this thesis contends that water sustainability would still be promoted through good governance if the implementation of the existing framework was not substandard, as it has been in various instances. Further, if the legal framework is amended to resolve its shortcomings, environmental decision making for purposes of water protection is very likely to improve, thus, rendering water sustainability in the mining sector more probable. It is cautioned, however, that even with the amendment, acceptable levels of water sustainability would only be achieved if implementation is carried out through good governance practices. With concerns regarding access to safe water in South Africa increasing on a yearly basis, one hopes that the South African government will take the necessary measures to enforce water protection in the mining sector effectively.

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